USBL-BOX

Positioning System

User Guide

IXSEA
AN IXBLUE COMPANY

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Overview of the USBL-BOX User Guide

This document is the User Guide for USBL-BOX. It must be read and understood prior to using the USBL-BOX acoustic navigation system.
The manufacturer shall in no case be held liable for any application or use that does not comply with the stipulations in this guide.
USBL-BOX User Guide is divided into seven parts:

- **Part 1: Introduction** – This section gives a general overview of USBL-BOX and describes the architecture of the system.
- **Part 2: Conventions and Specifications** – This section lists all the useful information about the USBL-BOX.
- **Part 3: Installing USBL-BOX** – This section helps you to install USBL-BOX and to connect it to the different devices of the ship.
- **Part 4: Configuring the USBL-BOX –** This section gathers the configuration procedures of the USBL-BOX.
- **Part 5: Setting the USBL-BOX to Work** – This section lists the tasks to go through before the beginning of the survey.
- **Part 6: Operating the USBL-BOX –** This section describes the system operating mode and the data monitoring.
- **Part 7: Maintenance** – This part lists all the maintenance operations that you can apply on USBL-BOX.

The abbreviations and acronyms used in this guide are listed hereafter.
A **Table of Contents** is available in the following pages to allow a quick access to dedicated information.

Text Usage

Bold	Bold text is used for items you must select or click in the software. It is also used for the field names used into the dialog box.
`Courier`	Text in this font denotes text or characters that you should enter from the keyboard, the proper names of disk Drives, paths, directories, programs, functions, filenames and extensions.
Italic	Italic text is the result of an action in the procedures.

Icons

The **Note** icon indicates that the following information is of interest to the operator and should be read.

THE **CAUTION** ICON INDICATES THAT THE FOLLOWING INFORMATION SHOULD BE READ TO FORBID OR PREVENT PRODUCT DAMAGE.

THE **WARNING** ICON INDICATES THAT POSSIBLE PERSONAL INJURY OR DEATH COULD RESULT FROM FAILURE TO FOLLOW THE PROVIDED RECOMMENDATION.

Abbreviations and Acronyms

AUV	Automated Unmanned Vehicle
CAF	Common Acknowledgment Frequency
CIF	Common Interrogation Frequency
CRF	Common Reply Frequency
DVL	Doppler Velocity Log
IIF	Individual Interrogation Frequency
INS	Inertial Navigation System
IRF	Individual Response Frequency
GPS	Global Positioning System
HRP	Heading Roll Pitch
LBL	Long Base Line
LED	Light Emitting Diode
MFSK	Multiple Frequency Shift Keying
MMI	Man Machine Interface
PHINS	PHotonic Inertial Navigation System
ROV	Remote Operated Vehicle
RT	Release Transponder
RTK	Real Time Kinematic
SLAM	Simultaneous Localization And Mapping
USBL	Ultra Short Base Line
UTC	Universal Time Coordinated

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I INTRODUCTION

I.1 Principle

System

The USBL-BOX system is used in order to supply information concerning one or several underwater objects or vehicles at a depth of up to 6,000 meters.
The system is based on a bidirectional exchange of acoustic signals between one or several acoustic transponders and an acoustic antenna installed underneath the vessel. The transponders can be placed on moorings or mounted on vehicles.

Electronic box

The USBL-BOX is an electronic box piloted by a web user interface enabling precise information concerning the position of the immerged acoustic transponders. The USBL-BOX is completed by POSIDONIA, an acoustic antenna. Together, the two products make up a USBL positioning system. The box is installed on board the vessel on a rack and is connected to the network by one or several work stations where the operator manages the positioning via the web user interface.

POSIDONIA antenna

The POSIDONIA antenna is installed underneath the hull of the vessel. It sends out acoustic signals via electric impulses generated by the box. The immerged acoustic transponders, either static (anchored) or dynamic (onboard underwater vehicles), receive and respond to these signals. The antenna receives all the responses through its four hydrophones. The box then decodes the received responses and estimates the relative transponder positions compared with the antenna. The antenna position is very precisely ascertained thanks to a GPS connected to the box. In this way the box is able to calculate the exact position of the transponders. Real-time information is forwarded to the USBL-BOX concerning the vessel's situation. This data enables the user to correct the position of the transponders and the antenna's movement.

Telecommand

The rack is also equipped with a remote control or telecommand function allowing functional orders to be sent to the transponders and to interpret responses and acknowledgement of receipt.

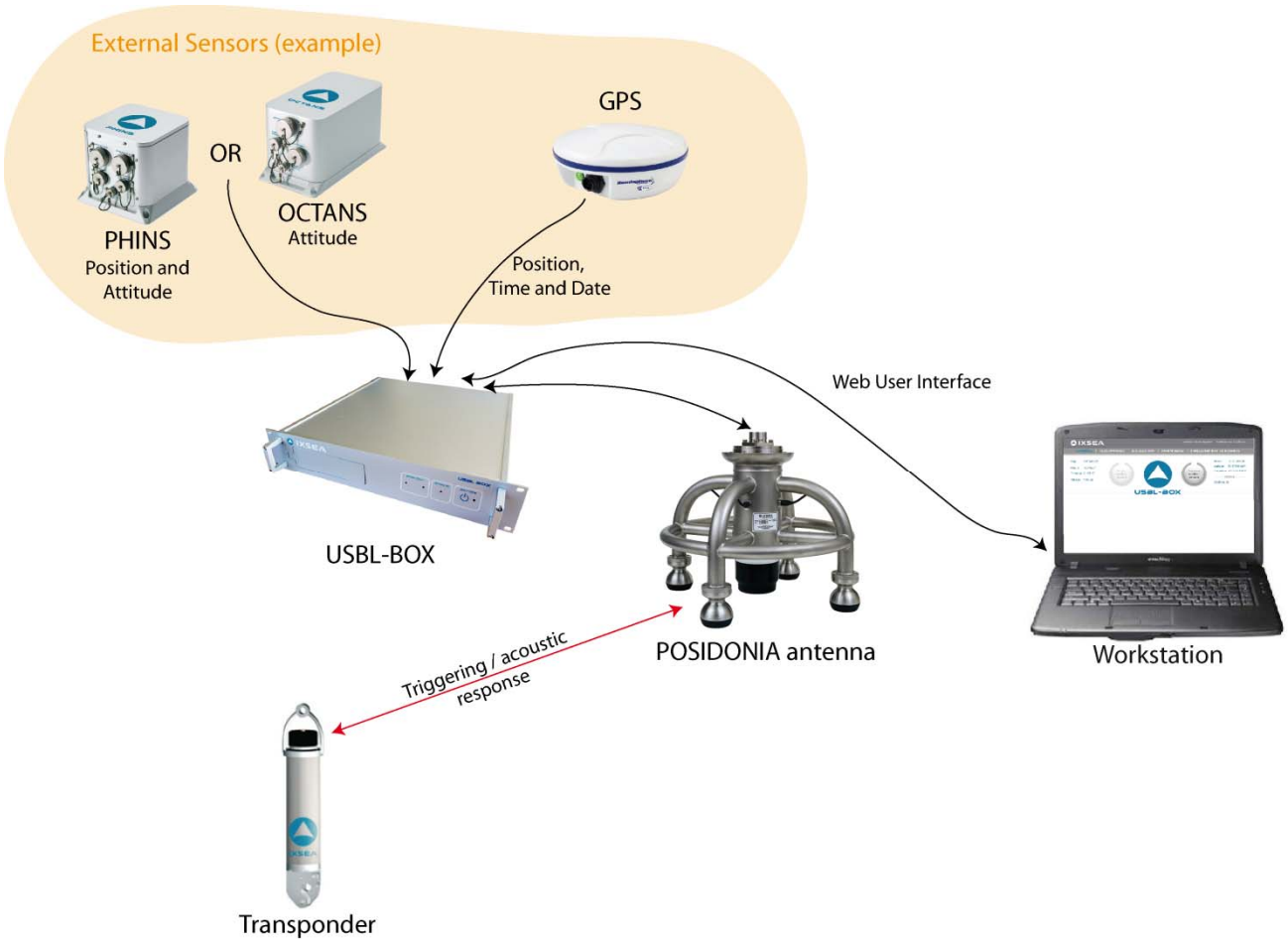


Figure 1 –USBL-BOX operating principle

I.2 Equipment Description

I.2.1 THE ELECTRONIC BOX

The USBL-BOX comes in a 19” 2U rack format. It consists of various connections at the front and also at the back which enables the various different elements of the system to be linked:

- Power supply
- POSIDONIA antenna
- Receiving and sending synchronization signals
- Serial receiving and sending, Ethernet port for external sensors and command control
- PPS entry for dating external sensor data

Figure 2 – USBL-BOX

For more information, go to section II.2.2.

I.2.2 WEB-BASED USER INTERFACE

The web user interface is a web application enabling configuration of the system (lever arms, management of connections, celerity profile, configuration and management of transponders) before each mission and checking of data during the mission. This application also enables recording of data and the sending of signals for the remote control. See use of Web-based user interface in section IV.

Figure 3 – Main window of the Web-based user interface

I.2.3 POSIDONIA ACOUSTIC ANTENNA (OPTION)

The acoustic antenna POSIDONIA (see Figure 4), is connected to the USBL-BOX via a specific cable. The antenna consists of four hydrophones and a transducer.
The transducer emits the signal generated by the USBL-BOX. The four hydrophones receive responses from the transponders with different phases. The differences phases enable the box to calculate the distance and the angle of emission of the response.
For further details see the POSIDONIA antenna user manual.

Figure 4 –POSIDONIA antenna: cage (left), flush (middle) and its cable (right)

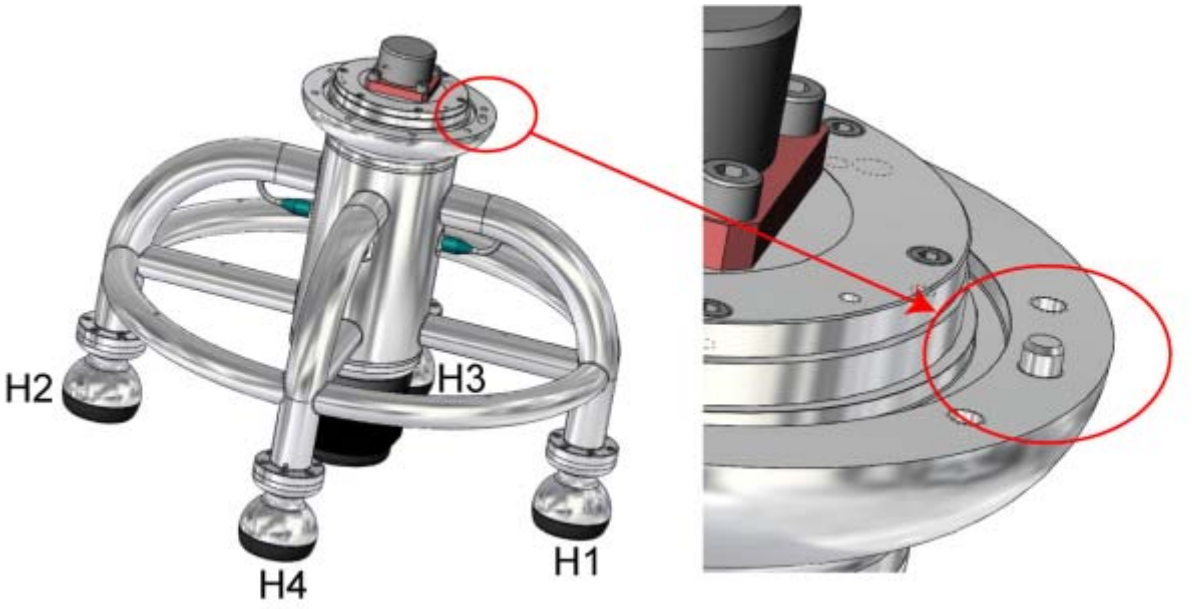


Figure 5 – Numbering of the antenna hydrophones and locating pin of hydrophone H1

I.2.4 TRANSPONDERS (OPTIONS)

The following iXSea transponders are designed to be used with the USBL-BOX:

- **RT961B2S Mk2 et ET961S Mk2**

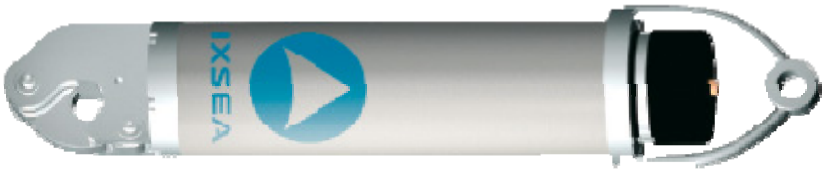


Figure 6 – RT961B2S Mk2

The USBL-BOX is compatible with the following existing transponders:

- **RTT471**
- **ET861 / RT861**

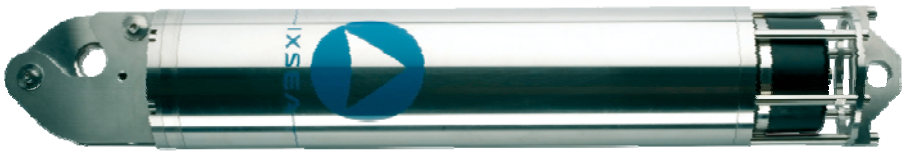


Figure 7 – RT861B2S

- **RAMSES 6000**

Figure 8 – RAMSES 6000

The transponders respond to positioning signals and to commands generated by the USBL-BOX and transmitted by the POSIDONIA antenna. The transponders are made up of two interrogation channels (individual and common) together with two types of response (individual and common). See the respective transponder installation and configuration in sections III.5 and V.1.2.

I.2.5 EXTERNAL SENSORS (OPTION)

I.2.5.1 Position External Data

In order to obtain the absolute geographical position of the immerged transponders, USBL-BOX must know the exact position of the POSIDONIA antenna. This position is given by the GPS and corrected by lever arms between the GPS and POSIDONIA antennae.

I.2.5.2 Attitude External Data (HRP)

In order to correct the GPS antenna position with POSIDONIA lever arms, the USBL-BOX must know the three-axis attitude of the vessel the moment the transponder response is received. An attitude control system provides this information for the USBL-BOX. The PPS port of the USBL-BOX is used to the actual time of data measurement from the control system before actually receiving the data itself.

I.2.5.3 Time External Data (UTC)

An external clock can be used to standardize the time between several different acoustic appliances working together.

II CONVENTIONS AND SPECIFICATIONS

II.1 Conventions

II.1.1 REFERENCE CENTER

The lever arm measurement point of reference is called the central reference point, or CRP. This point is chosen arbitrarily. In general it is the centre of gravity or centre of rotation of the vessel but can in effect be any other point of the vessel. The centre of gravity or the centre of rotation of the vessel is the point which moves least. All the various sensors installed on the vessel are positioned according to this point. In this way it is easy to establish the distances between the appliances and to calculate the lever arm. An example of CRP is show in figure 9.

II.1.2 REFERENCE AXLES

Having defined the central reference point in the previous paragraph, now we define the axes of reference. These axes are illustrated in Figure 9. They define the signs of the lever arms of the external sensors.

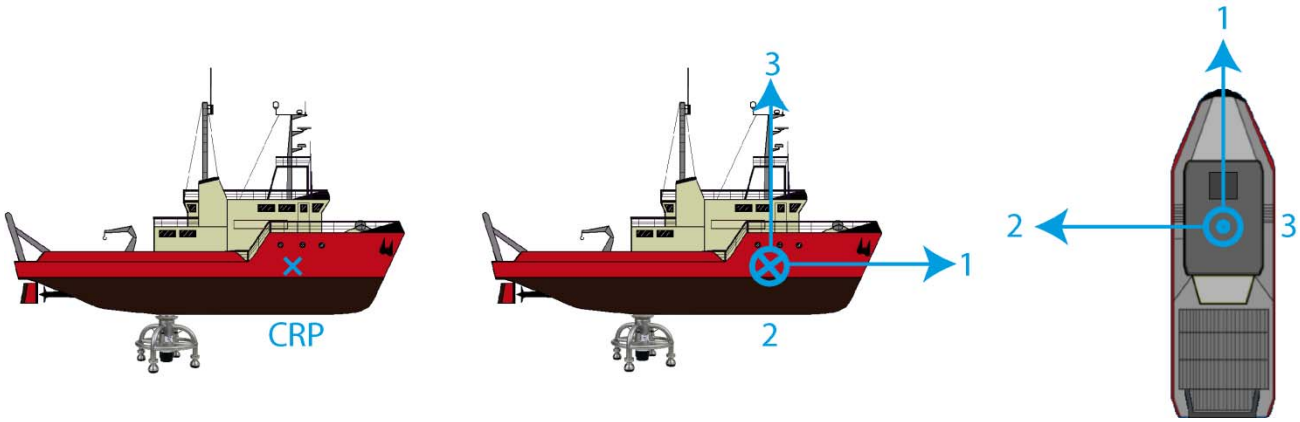


Figure 9 – Example of CRP and Reference Axes

II.2 Specifications

II.2.1 MECHANICAL SPECIFICATIONS

- Dimensions: 483 mm / 89 mm
- Weight: 5.8kg
- Temperature limits when stocking the box: -20° to +70°C
- Temperature limits when the box is in use: 0° to +50°C

A mechanical drawing is provided in Appendix E.

II.2.2 ELECTRICAL SPECIFICATIONS

- Force: 100 – 240V / 50 – 60Hz
- Power: below 15 W with impulses reaching up to 80 W

II.2.2.1 Plugs on the Front Face

The front of the USBL-BOX consists of four LEDs, the ON/OFF switch and a compartment containing the connections.

Figure 10 – Front face of the USBL-Box (door closed)

- The **ON/OFF** switch with its LED
- Three synchronizing LEDs:
  - 1 LED **SYNC IN** lasting up to 100 minutes
  - 2 LEDs **SYNC OUT** lasting up to 100 minutes

The following connections are installed in the compartment. They are dedicated to technical support operations:

Figure 11 – Opened compartment door

- **CONSOLE**: DB9 male for the test serial port RS232
- 7 BNC female
  - **SYNCHRO_OUT MAIN** and **SYNCHRO_OUT SECONDARY**: isolated and duplicated on the front and the back
  - **SYNCHRO_IN**: isolated and duplicated on the front and the back
  - **HYDRO 1, HYDRO 2, HYDRO 3 and HYDRO 4**: hydrophones designed to emit a signal in order to validate installation without an antenna and for the measurement of signals emitted by the antenna.

II.2.2.2 Plugs on the Rear Face

Figure 12 – Rear face of the USBL-BOX

- **125 - 240 VAC**: Power supply
- 4 BNC female
  - **SYNC OUT MAIN, SYNC OUT SECONDARY**: synchronized OUT isolated
  - **SYNC IN TRIGGER**: synchronized IN isolated
  - **SYNC IN PPS**: PPS input
- **REMOTE ON/OFF**
- **SERIAL A, SERIAL B, SERIAL C, SERIAL D**: 4 DB9 male for serial port input/output configurable 422/232 and isolated
- **ETHERNET** 1 Port Ethernet 10/100 Mbit/s RJ45
- **ACOUSTIC ARRAY:** Antenna Connecter Souriau 41 points

II.2.2.3 Wiring of the Serial Links

Serial linking cords RS232 and RS422 feature in Figure 13 and Table 1.

Table 1 – Wiring of RS232 and RS422

PIN	RS232	RS422
1		Rx-
2	Rx	Rx+
3	Tx	Tx-
4		Tx+
5	Ground	
6		
7		
8		
9		

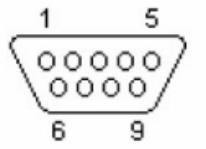


Figure 13 – DB9 Male

II.2.2.4 Synchronization Signal Definition

Synchro IN — Synchro IN could be a high or low active signal lasting for minimum amount of time as defined in the web user interface; tension is between 3 V and 24 V.

Synchro OUT — Synchro OUT is a high active signal lasting for 10 ms; tension is 5 V. See Figure 14.

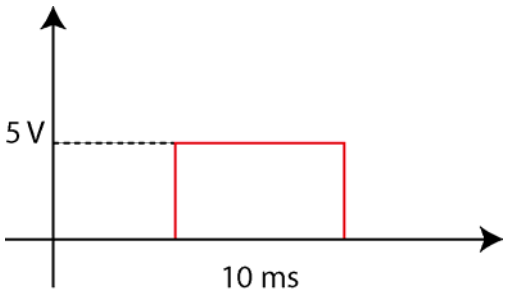


Figure 14 – Synchro OUT

III INSTALLING THE USBL-BOX

Before installing your USBL-BOX for the first time, we recommend you check all the parts in the delivery box (see section 0). Once this has been done, installation takes place in four steps:

- Installation of the box on the 19" rack (see section III.2)
- Installation of external sensors (see paragraph III.3)
- Installation of POSIDONIA antenna (see paragraph III.4)
- Installation of transponders (see paragraph III.5)

The architecture of the complete system is shown in Figure 15.

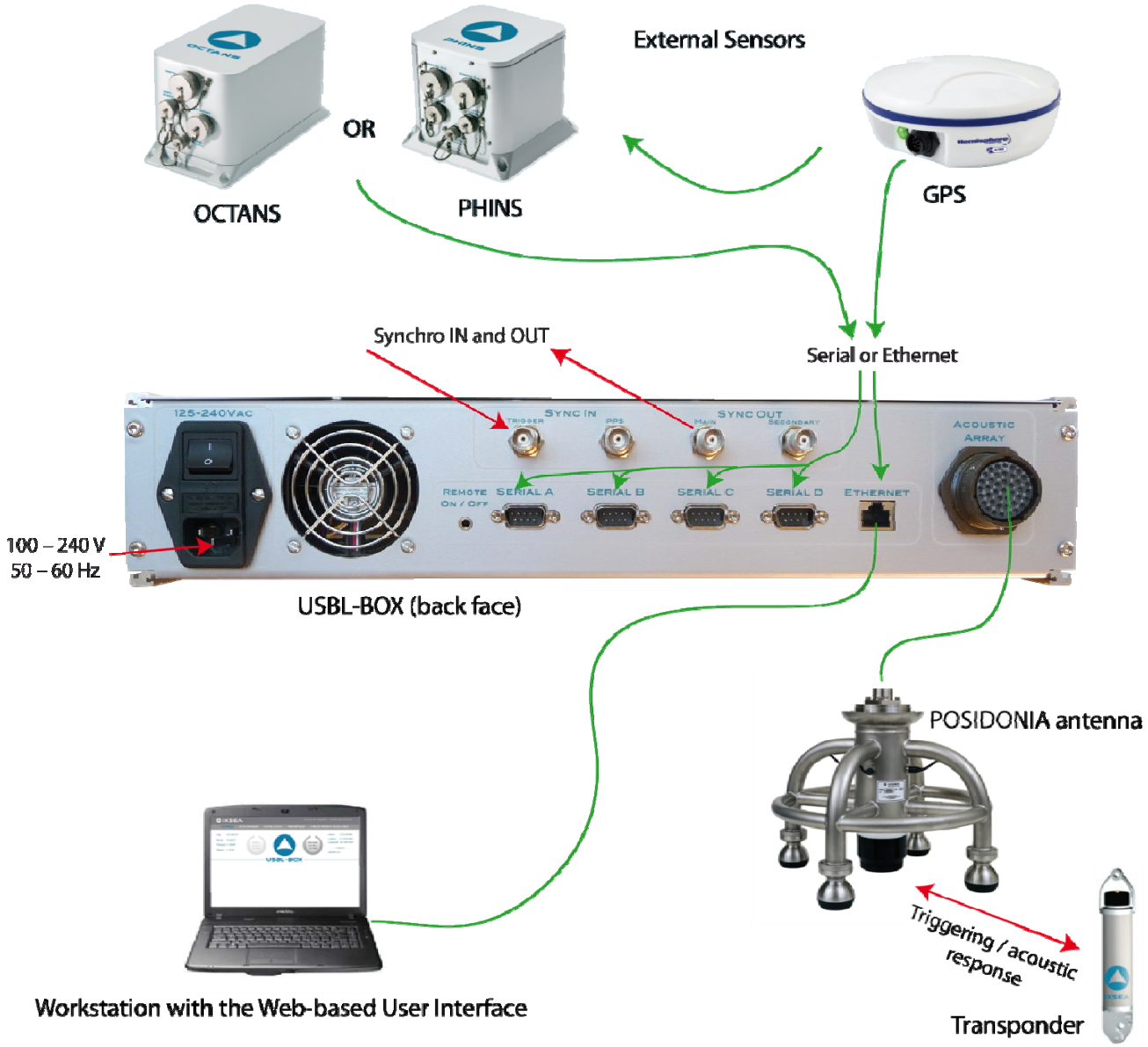


Figure 15 – Architecture of the USBL-BOX positioning system

III.1 Checking the Delivery

You have just received your equipment in protective boxes. Before starting the installation procedure, **we recommend you to check the contents of the boxes immediately on reception.** In particular, you should check that all the parts have been delivered and that none of them have been damaged.
To check this, you will find a detailed list of contents in the packaging. This list will have been completed and checked by iXSea shortly before sending out the equipment.

ON RECEPTION, YOU MUST CHECK THE STATE OF THE EQUIPMENT; IXSEA MUST BE INFORMED OF ANY DAMAGE WHICH HAVE BEEN CAUSED. CHECK THAT THE LABEL ON EACH PART IS STILL WHITE.

It is strongly recommended to contact the insurance company if any damage has been detected.

III.2 Installing the Rack

The USBL-BOX is assembled in a standard way using the four screws at either end of the front of the box and loading it onto a 19” rack.

III.3 Installing the External Sensors

The USBL-BOX functions with external sensors with supply data enabling positioning of the immerged transponders. The external sensors are:

- A GPS or an inertial system providing absolute positioning
- An attitude sensor providing information on the vessel’s attitude the moment the acoustic signals are received
- A clock enabling the user record when the data is received

The installation of these sensors depends on each sensor. Please refer to the specific user manuals.

III.4 Installing the POSIDONIA Antenna

Please refer to the specific POSIDONIA antenna manual. The parameters for installation are to be input in the Web-based user interface, see section IV.3.

III.5 Installing the Transponders

Please refer to the specific transponder manual. The parameters for installation are to be input in the Web-based user interface, see section V.1.2.2.

IV CONFIGURING THE USBL-BOX

The configuration of the USBL-BOX is carried out by means of the Web-Based User Interface (see section IV.1). Two parameters are configured in this section:

- Input and output parameters which are defined after system installation
- Survey parameters set at the beginning of each survey

In this section the configuration of input and output parameters is detailed. Survey parameters are defined in section V.1. First, a quick overview of the Web Based User Interface is necessary.

IV.1 Web-Based User Interface General Overview

IV.1.1 ENVIRONMENT

Web-Based User Interface Required Environments

Browsers

The PC must be equipped with one of the following WEB browser:

- Mozilla Firefox 4 and later versions
- Internet Explorer 9 and later versions

Furthermore, the following applications must be installed on the PC:

- Flash Player 10.2 and later versions
- Java Runtime Environment version 6 edition 24 (1.6.0_24) and later versions

Starting the Web-Based User Interface

On a PC

The communication with the PC can be performed either directly through an Ethernet link or through a local network. The communication is made in an https domain so it includes encryption and secure identification of the server.

The Web-based User Interface is launched from the WEB browser hosted on the PC. The URL to enter in the address box is for example https://192.168.64.17 and is redirected to https://192.168.64.17/control/.

The login is `user` and the password is `userXI`.

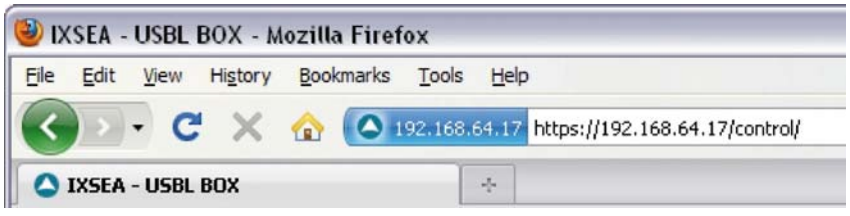

IXSEA - USBL BOX - Mozilla Firefox
File Edit View History Bookmarks Tools Help
192.168.64.17
https://192.168.64.17/control/
IXSEA - USBL BOX

Figure 16 – USBL-BOX IP address

IV.1.2 MAIN WINDOW

The main window of the USBL-BOX Web-based User Interface is made up of various elements (see Figure 17):

- Access to all navigation data (navigation data menu)
- Access to maintenance tasks (maintenance menu)
- A choice of languages (English or French)
- A choice of operating mode (day mode or night mode)
- Menu bar
- System status display
- Main data display
- Two command buttons

You can resize the page. By doing so, certain elements disappear or become smaller depending on the size of the window.

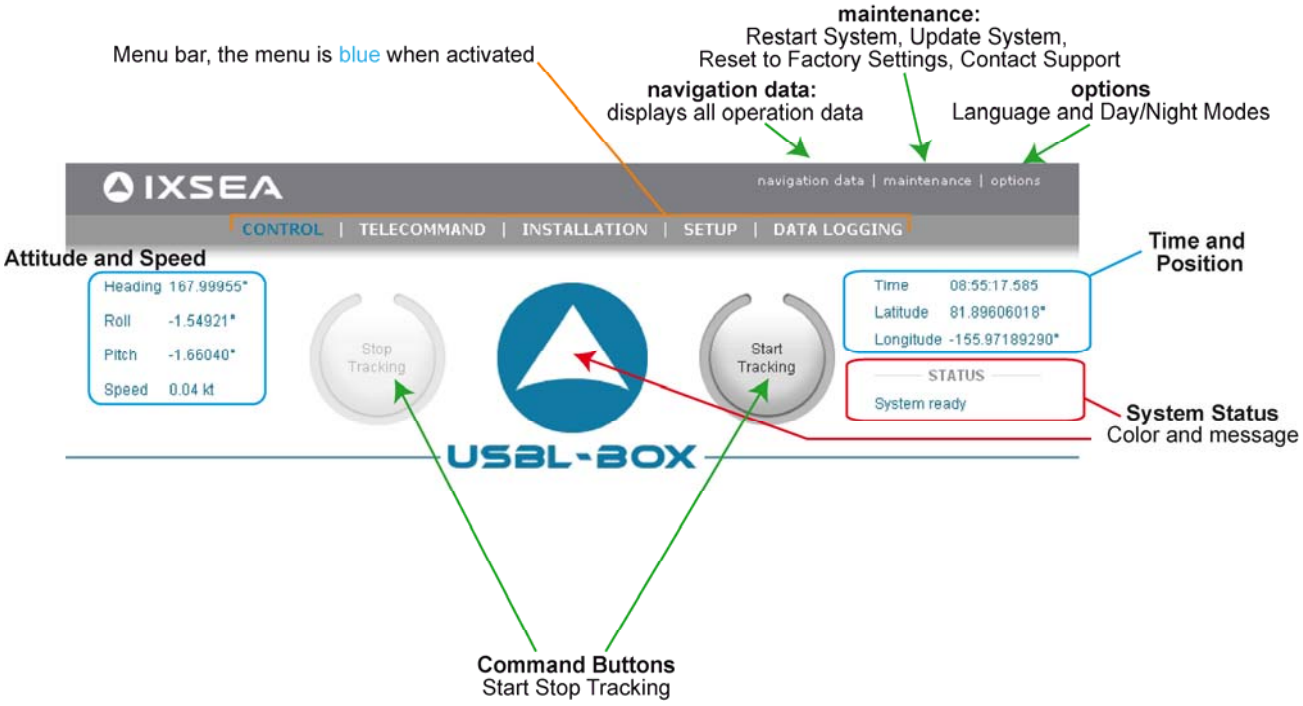


Figure 17 – Main window of the USBL-BOX Web-based user interface

iXSea Logo

The iXSea logo appears on every page and tab of the Web-based user interface. It supplies you with visual information on the status of the system using an associated color coding system (see section IV.1.5). By clicking on this you obtain a quick access to detailed status displays of the system's different elements (see section IV.1.4).

IV.1.3 HANDLING THE WINDOWS AND TABS

Use the menu to navigate in the interface windows as shown in Figure 18.

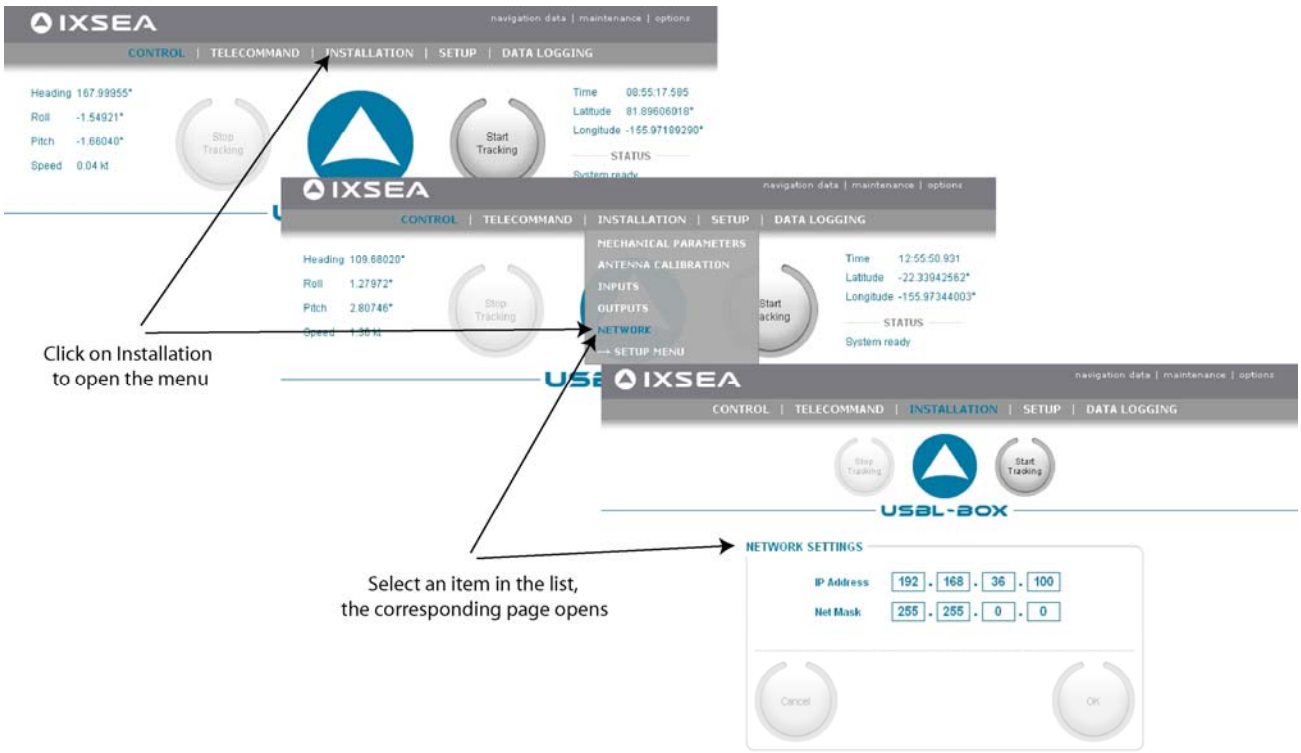

Click on Installation
to open the menu
Select an item in the list,
the corresponding page opens
CONTROL | TELECOMMAND | INSTALLATION | SETUP | DATA LOGGING
NETWORK SETTINGS
IP Address 192 . 168 . 36 . 100
Net Mask 255 . 255 . 0 . 0

Figure 18 – Navigation through the interface pages

IV.1.4 HANDLING THE iXSEA LOGO

A click on the iXSea logo opens the detailed status pop-up. The Figure 19 sums up the status of the

- Antenna
- External Sensors
- Electronic

The color code applies for the indicators and text labels displayed in these pop-up windows. When a problem occurs, the color of the iXSea logo changes and these pop-up automatically appear showing immediately which equipment has raised the problem. Close the pop-up windows by clicking on the iXSea logo.

Figure 19 – Control page with detailed status (tracking switched on)

IV.1.5 COLOR CODE

Valid for text labels, status indicators and logo, the color code is defined in the Table 2.

Table 2 - Color code definition

Color	Definition
Grey	Inactivity
Flashing Grey /Blue	System Configuration (during initialization)
Blue	Activity, nominal operation
Orange	Activity, warning, the system works with limited efficiency
Red	Activity, alarm, part of the system is not working correctly

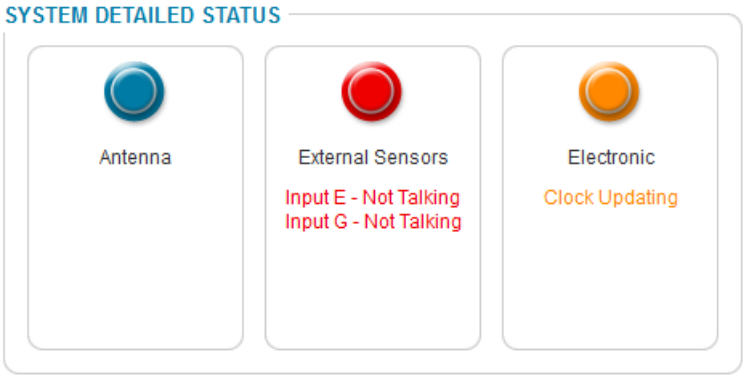


Figure 20 – Warning and alarm status examples

IV.1.6 GENERAL RULES FOR USING COMMAND WINDOWS

The command windows allow you to display or modify the configuration parameters. At first delivery, these parameters are set to default values. You have to modify them to fit your needs:

Drop-down lists

By selecting it directly in the drop-down list:

You can also use the up arrow (**[↑]**) and down arrow (**[↓]**) keys to to increase or decrease the numerical values.

Text

By typing it in the dedicated area:

You can also use the up arrow (**[↑]**) and down arrow (**[↓]**) keys to increase or decrease the numerical values.

Incorrect value is immediately indicated by red color:

Expanding hidden area

In order to keep each web-based page as small as possible, only the main parameters are default visible. You can expand the hidden area by clicking on its text label title:

OK/Cancel buttons

Each command page contains the same buttons. The buttons appear as soon as a modification or a selection has been made in the command page:

To validate the new configuration and store it in the electronic.

To return to the previous entered values.

Other Button

On “mouse over” action, orange color may surround a button to indicate that the action performed by clicking on the button has important consequences.

Example of such an action: the system restarts.

IV.1.7 TOOL TIPS

By moving your pointer above some parameters and iXSea logo, you access its tool tip (see Figure 21).

Figure 21 – Tool tip example

IV.1.8 LANGUAGE AND DISPLAY OPTIONS

The menu **option** in the top right hand corner of the main window gives you access to **Language (French or English)** and also the **Display (Day mode** and **Night mode).** The night mode is designed to reduce the screen's glare which could affect the driving of the boat.

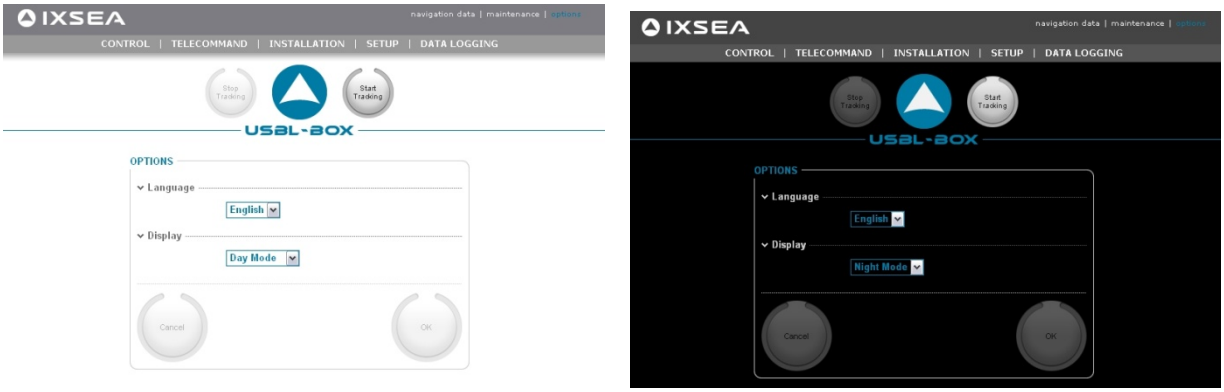
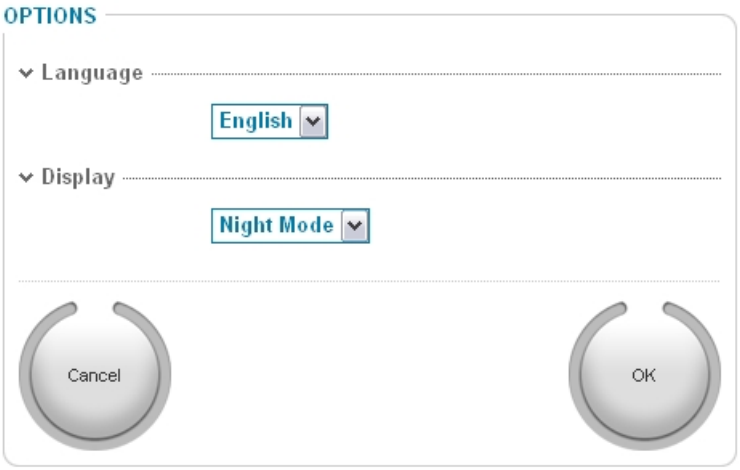


Figure 22 – Day and night modes

Procedure

Step	Action
1.	Click on **options** in the upper right corner of the main window. *The **OPTIONS** page opens.*
2.	Select the **Language** type in the scrolling list.
3.	Select the **Display** mode in the scrolling list.
4.	Click on **OK** to validate your choice and to apply it to the Web User Interface.
5.	End of Procedure.



IV.2 Configuring the Network

The USBL-BOX can only be configured via a Web Based User Interface from any PC. The purpose of this section is to explain how to connect the USBL-BOX to a PC that is part of a local network or not. You can be in one of the two situations:

- Connect USBL-BOX to a single PC, section IV.2.1
- Connect USBL-BOX to the local network, section IV.2.2

IV.2.1 CONNECTING THE USBL-BOX DIRECTLY TO A WORKSTATION

In this section you connect the USBL-BOX to a single PC via an Ethernet cable. Then you configure the PC network parameters in order that the PC “sees” the USBL-BOX.

IV.2.1.1 Overview of the Connections

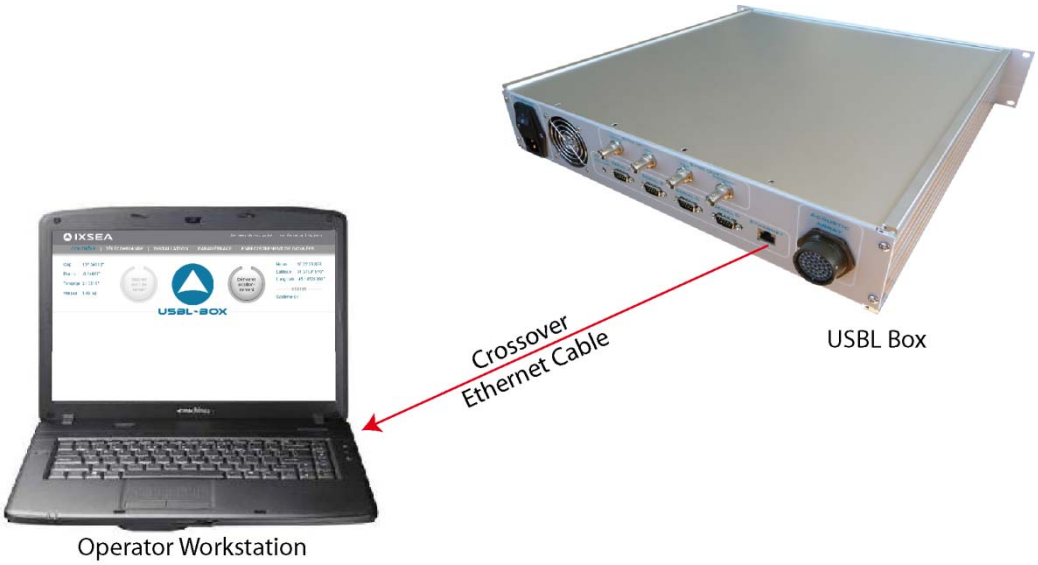


Figure 23 – L’USBL-BOX connectée directement à une station de travail

Equipment Needed:

- 1 x PC or Laptop (with an Ethernet port)
- 1 x Cat 5 Crossover Ethernet Cable

By default, the USBL-BOX is already assigned with a default IP address. When connecting one PC to the USBL-BOX, it is only necessary to adapt the PC to the USBL-BOX configuration.

The default IP address is printed on the label stuck on the rear of the small door of the front face of the USBL-BOX. See Figure 24

- **IP address**: 192.168.64.17
- Network mask address: 255.255.255.0

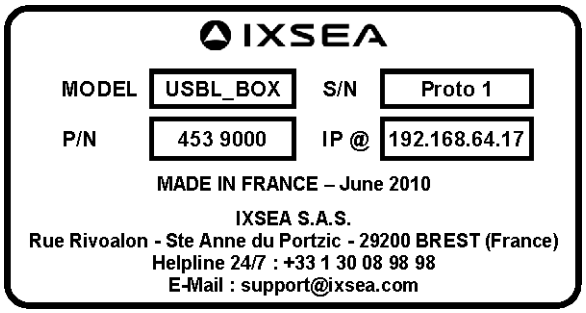


Figure 24 – Etiquette présente sur le revers de la porte du compartiment de la face avant

192.xxx.xxx.xxx is an address of class C, the corresponding mask is by default 255.255.255.0.

IV.2.1.2 Configuring the Workstation

IP Address

Assuming that the USBL-BOX IP address is 192.168.64.**1**, and the subnet mask is 255.255.255.0. Before configuring the PC, choose the PC IP address. This address must be taken from the same subset as the address configured in the USBL-BOX. In this example, 192.168.64.**2** is used for the PC IP address.

Subnet Mask

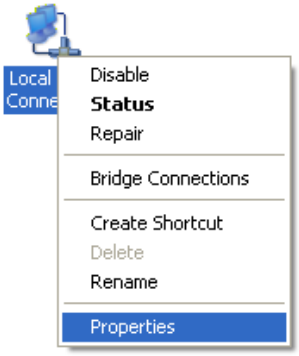
The subnet mask must be the same between the USBL-BOX and the PC.

Procedure

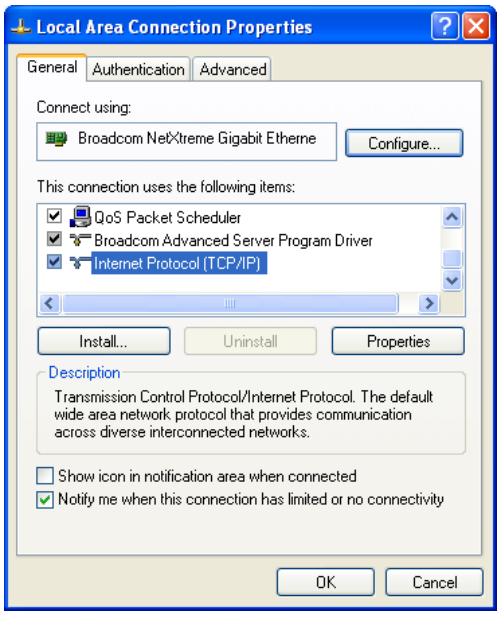
Step	Action

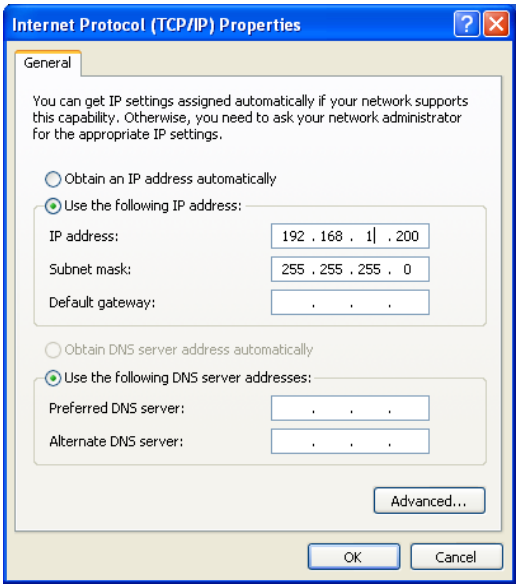
1. Access on the PC to the **Network Connections Window**:
   - Locate the icon “My Network Places” on the desktop screen of the PC, right click on the icon then select **Properties**
   - If you cannot locate this icon, you can still proceed by selecting **Start** menu > **Connect To** > **Show all connections**.
   - Select **Start** menu > **Settings** > **Control Panel**, then double click on the icon **Network Connections**.

2. Right click on **Local Area Connection** icon and select **Properties***:*



The **Local Area Connection Properties** *window opens:*



Step	Action
3.	Double click on **Internet Protocol (TCP/IP)** label text. *The* Internet Protocol (TCP/IP) Properties *window displays:* 
4.	Select the option **Use the following IP address** and enter `192.168.64.135` for the **IP address** field and `255.255.255.0` for the **Subnet mask**.
5.	Leave the **Default gateway** and **DNS server** addresses blank.
6.	Click on **OK** button to validate the modifications. *You have set up the PC configuration to enable the Ethernet communication between the PC and the USBL-BOX.*
7.	End of Procedure.

The PC IP address used here takes into account that the USBL-BOX is using its default configuration with its default IP address terminated by "**1**". You may change the IP address and subnet mask of the USBL-BOX. In either case the subnet masks of both PC and the USBL-BOX must be the same.

IV.2.2 CONNECTING THE USBL-BOX TO A LOCAL NETWORK

In this section, you connect the USBL-BOX to the local network via an Ethernet switch (see section IV.2.2.1). Then you set up a PC from the network to have access to the USBL-BOX network parameters. You edit these parameters to make the USBL-BOX compatible with the network (see section IV.2.2.2). The global procedure is explained in section IV.2.2.3.

IV.2.2.1 Overview of the Connections

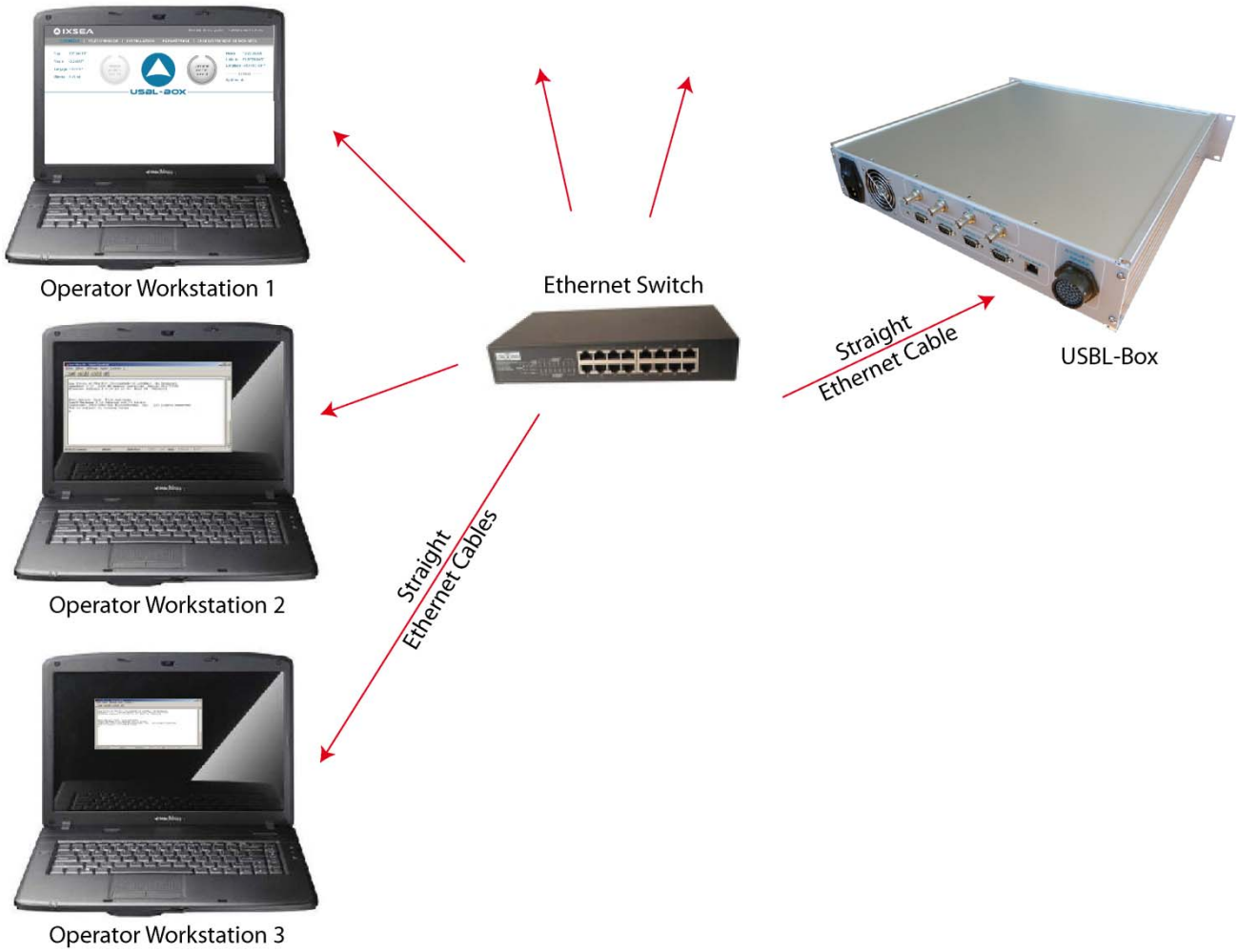


Figure 25 – USBL-BOX connected to the local network

Equipment Needed:

- One Cat 5 Straight Ethernet Cable to set between the USBL-BOX and the switch
- A free slot in the local network switch

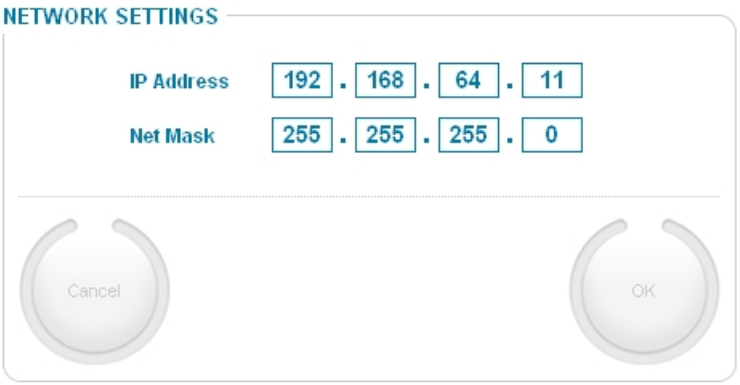
You configure the USBL-BOX to make it compatible to your local network. The choice of the different parameters (IP address and subnet mask) is explained in Appendix C.

IV.2.2.2 Configuring the Network Interface of the USBL-BOX

After connecting the USBL-BOX to a PC, with the USBL-BOX powered on, you can launch the Web-based User Interface on the PC and you can edit the USBL-BOX network parameters. You can then make the USBL-BOX compatible to your local Ethernet network.

Every USBL-BOX is assigned with its own IP address and a net mask. In order to insert the USBL-BOX in your local network, you must edit the network parameters.

Procedure

Step	Action
1.	Click on **INSTALLATION** in the menu and select **NETWORK**. *The **NETWORK SETTINGS** window opens. The IP address and the mask fields are filled by the default values.* 
2.	Edit the **IP Address** by clicking in the fields and entering new values.
3.	Edit the **Net Mask** by clicking in the fields and entering new values.
4.	Click on **OK** to validate the input of the values.
5.	Switch the USBL-BOX off and then switch it on again.
6.	Reconnect your browser to the new URL https://xxx.xxx.xxx.xxx/.
7.	End of Procedure.

IV.2.2.3 Connection Procedure

Procedure

Step	Action
1.	Connect physically the USBL-BOX to the local network as shown on Figure 25. The USBL-BOX being in default network configuration that is not compatible with your local network, the USBL-BOX is not visible from any PC present in the network.
2.	Select one PC from which you are going to access and configure the USBL-BOX. Note the IP address of this PC. Do not lose this IP address because you need it in step 7.
3.	Follow the procedure of section IV.2.1 to set up the PC to be able to see the USBL-BOX from this PC. See Appendix C for the choice of an IP address compatible with the USBL-BOX IP address. *The USBL-BOX is now visible from this PC.*
4.	Choose an IP address compatible to the local network. You are going to assign this address to the USBL-BOX to include it into the local network.
5.	Add this address to the list of IP addresses of the elements present in the local network.
6.	Launch the Web-based User Interface. See section IV.1.
7.	See section IV.2 to edit the USBL-BOX network parameters. Once the PC is configured and that you can see the USBL-BOX from the PC, assign the new IP address to the USBL-BOX. For the Net Mask, enter the local network mask.
8.	Configure the PC in its original IP network configuration (before step 3). *Now all PCs in the network can see the USBL-BOX.*
9.	End of Procedure.

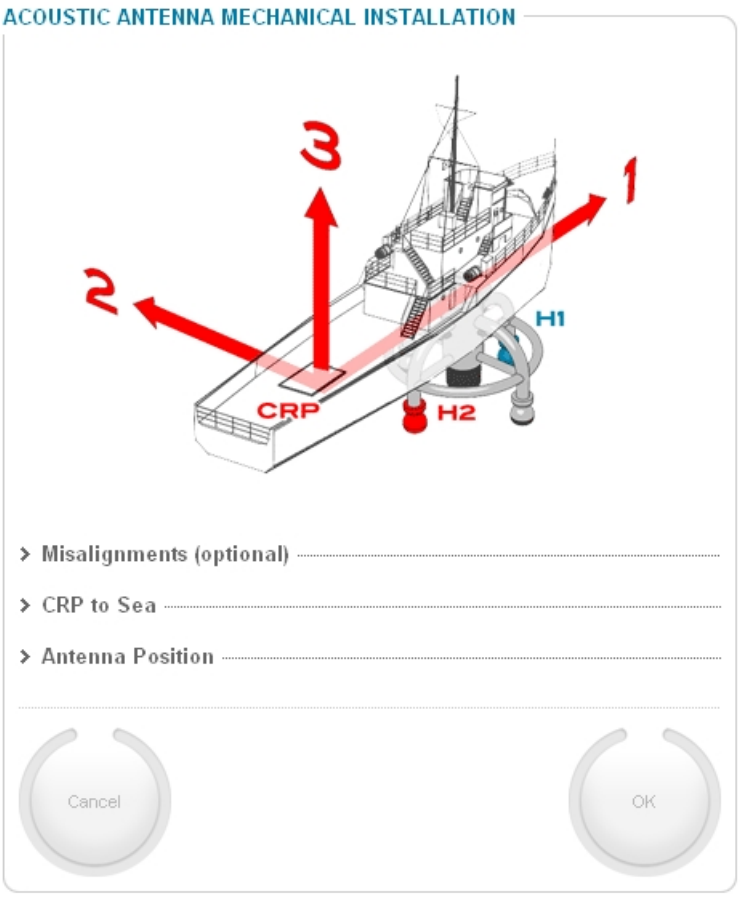
IV.3 Configuring the Acoustic Antenna

The position of the POSIDONIA acoustic antenna either in built-in or cage version must be very accurately known. This is calculated just after installation and must be checked every time the vessel goes into dry dock. These parameters are the following:

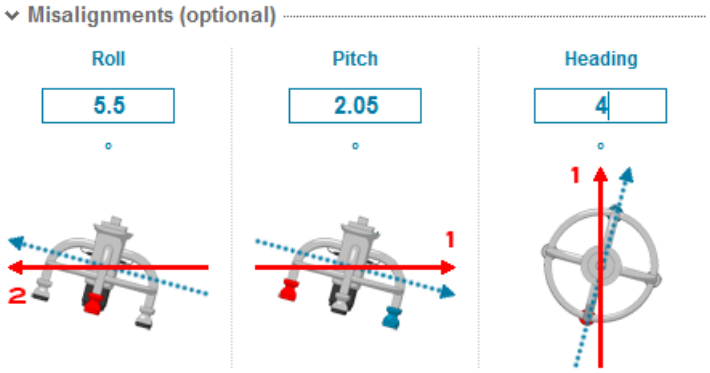
- **Misalignment:** three angular offsets of the antenna's axes compared with the boat's axes. They are roughly measured during the installation procedure. A not so precise installation can be here corrected. A ideally perfectly installed antenna (H1 towards the bow and H4 towards the port) has offsets equal to (0, 0, 0).
- **CRP to Sea:** is the position of the sea surface on the vertical axis of the ship. For example if the CRP is 2 meters above sea surface, then the position of the sea surface on the vertical axis is -2 meters.
- **Lever arms:** the three distances between the CRP and the antenna's mounting flange along the three axes of the boat. See the definition of the axes and the CRP in section II.1.

Procedure

Step	Action
1.	Click on the menu **INSTALLATION** and select **MECHANICAL PARAMETERS.**

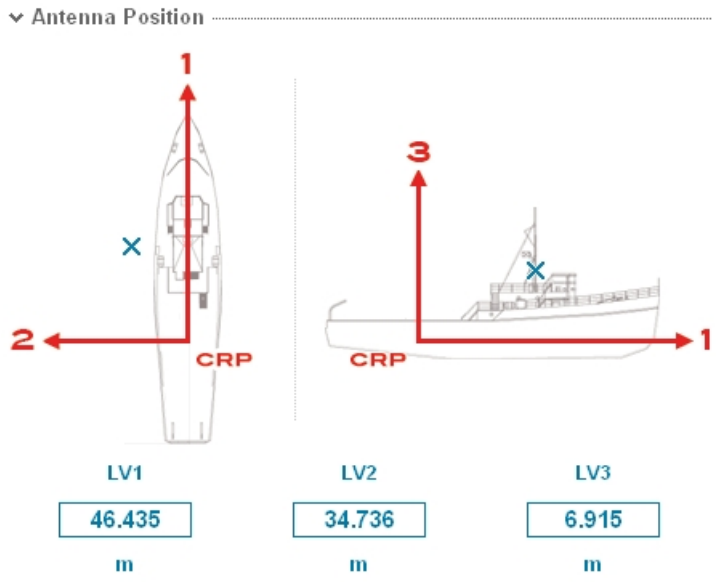


Step	Action
2.	In **Misalignments (optional)** enter (0, 0, 0) for a perfectly well installed antenna (H1 towards the bow, H4 on port side).



3.	In **CRP to Sea**, enter the value of **Distance.**

4.	In **Antenna Position**, enter the **LV1, LV2** and **LV3** values.



5.	Click on **OK** to validate and send this data to the USBL-BOX.
6.	End of Procedure.

IV.4 Configuring the Inputs and Outputs

This chapter describes the communication between the USBL-BOX and the external sensors. These parameters are divided into input parameters (see paragraph IV.4.1) and output see paragraph IV.4.2).

These parameters are accessible in the **INPUT** and **OUTPUT** elements of the **INSTALLATION** menu.

IV.4.1 Configuring the Inputs

Liaisons

Four serial links and an Ethernet link limited to four ports are available to transmit this data to the USBL-BOX.

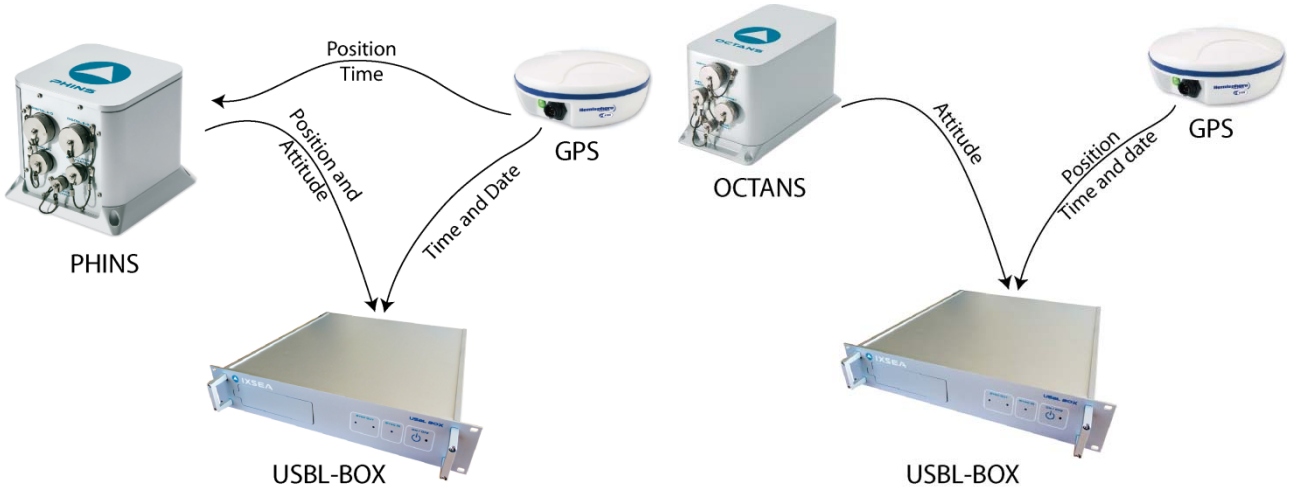


Figure 26 – Example of external sensors connected to the USBL-BOX

Each serial link and each Ethernet link can be used simultaneously with input and output. Only the serial link configuration must absolutely be the same for input and output. This is not the case for Ethernet links.

Data

The input data for the USBL-BOX is as follows:

- **Position**: the geographical position of the vessel is typically supplied by GPS or by an inertial system likewise connected to a GPS.
- **HRP**: the vessel's heading, roll and pitch data is typically given via an appliance supplying information on attitude and orientation.
- **Pressure**: pressure can be supplied by serial link through a transponder equipped with a pressure sensor operating in answer mode.
- **Temperature**: variations in temperature are given by the temperature sensor situated close the antenna allowing you to estimate the rapidity of sound via the hydrophones and the transducer.
- **UTC**: time and date information is supplied in order to record what the system is doing**.** An external clock or a GPS can supply this data.

IV.4.1.1 Input Stream Parameters

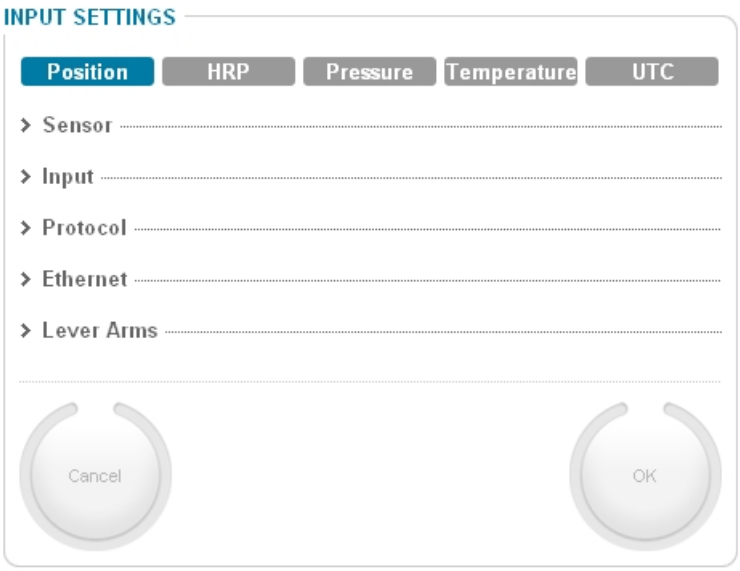
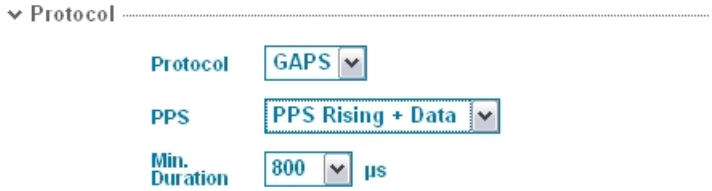
Below you will find the various parameters that you have to configure for each incoming link. Some data does not need a specific sensor nor, from time to time, lever arms.

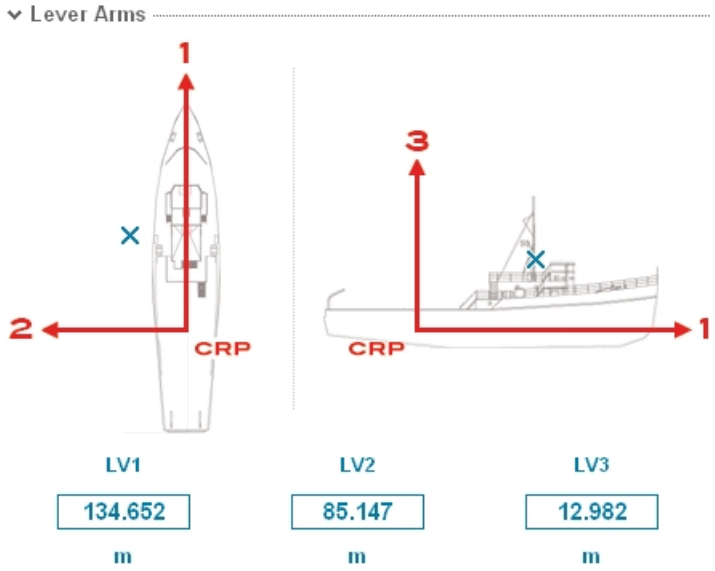
- **Sensor**: type of sensor supplying position data.
- **Input**: type of port containing information on position, a choice of four **serial ports** (A, B, C, D) and four **Ethernet** links (E, F, G, H).
- **Protocol**: type of **protocol** sent by the chosen sensor. The protocol may be accompanied by a synchronized **PPS** used to record incoming data. There is a choice of four options for the **PPS**, operated on a rising or falling edge, before or after the data has been given. The **Min. Duration** of the PPS below which it does not operate can also be recorded. See the protocols in Appendix A and B.
- **Serial**: if the chosen link is **serial**, the link parameters are as follows:
  - **Parity**: None, Odd, Even
  - **Stop bites**: 1.0 or 2.0
  - **Standard**: RS232 or RS422
  - **Baud output**: selected from a predefined list ranging from 600 to 115,200 bauds (output from port A is permanently fixed at 115,200 bauds)
- **Ethernet**: if the chosen link is **Ethernet**, the link parameters are as follows:
  - **Transport layer**: may be **TCP Server**, **TCP Client** or **UDP Broadcast**.
  - **IP**: the IP address of the target (only for a transport layer **TCP Client**)
  - **Port**: the number of the port
- **Lever arms**: the lever arms represent the distance along the vessel's three reference axes between the position of the sensor and the position of the CRP. See the CRP agreements in paragraph II.1.1 and paragraph II.1.2 for the vessel's reference axes. Let the values to 0.0 meters if the positioning sensor corrects itself the output positions by referencing them to the CRP.
- **Misalignments**: The correction given by the misalignments values allow to adapt the system to a sensor producing data in different reference axis. In the normal case you should enter (0, 0, 0).

IV.4.1.2 Configuration Procedure

The configuration procedure of input data is detailed in this paragraph.

Procedure

Step	Action
1.	Click on the **INSTALLATION** menu and select **INPUT**. *The **CONFIGURATION OF INPUT** window opens.* 
2.	Click on **Position, HRP, Pressure, Temperature** or **UTC**. *The different parameters to be configured are shown.*
3.	Only for **Position** and **HRP** data, in the **Sensor** component, select the type of sensor from the drop-down list.
4.	In the **Input** component, select the type of **Port**. *The type of link parameters are shown in the **Serial** or **Ethernet** component.*
5.	Only for **Position, HRP** and **UTC**, in the **Protocol** component, select the **Protocol** and the type of **PPS** and its **Length of time (mins.)** (from 50 µs to 1,000 µs). 

Step	Action
6.	If you have selected a **Serial Port** in step 4, enter the **Parity**, **Stopbits**, **Standard** and **Baudrate**.
7.	If you have selected an **Ethernet Port** in step 4, enter the following parameters: *According to the layer chosen, there may be an IP address for more information.*
8.	Only for **Position** data, in **Lever arms**, enter distances **LV1**, **LV2**, **LV3** separating the position sensor from the vessel's CRP. Let these values to 0.0 m if the position sensor corrects itself the output positions by referencing them to the CRP. 
9.	Only for **HRP** data, in **Misalignments**, enter the values for **Pitch, Roll** and **Heading**, Let 0.0° if the attitude sensor corrects itself the output data by referencing them to the CRP.
10.	Click on **OK** to validate your input data configuration and send it to the USBL-BOX.
11.	End of Procedure.

IV.4.2 CONFIGURING THE OUTPUTS

The USBL-BOX calculates the various positions of the immersed transponders. Four serial links and a four-port Ethernet link are available to transmit these positions to other appliances. A certain number of formats are also available to enable USBL-BOX compatibility with other appliances.

Each serial link and Ethernet link can be used simultaneously for input and output. Only the serial link configuration must be the same for input and for output. This is not the case for Ethernet links.

IV.4.2.1 Output Stream Parameters

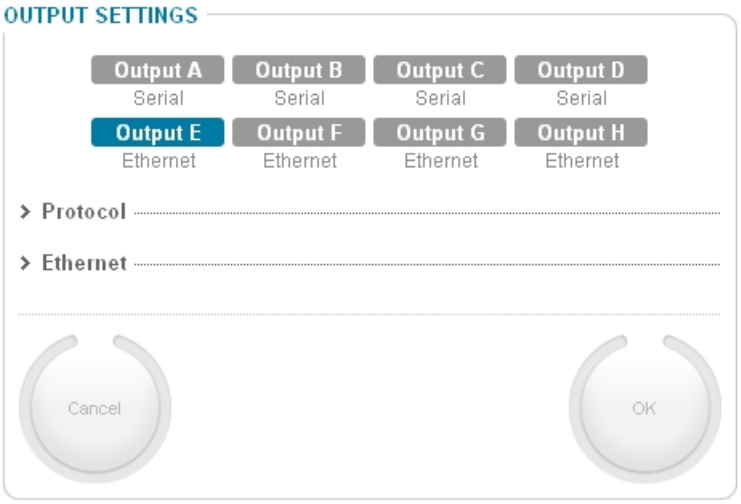
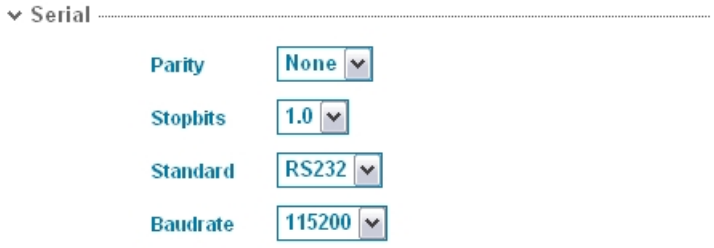
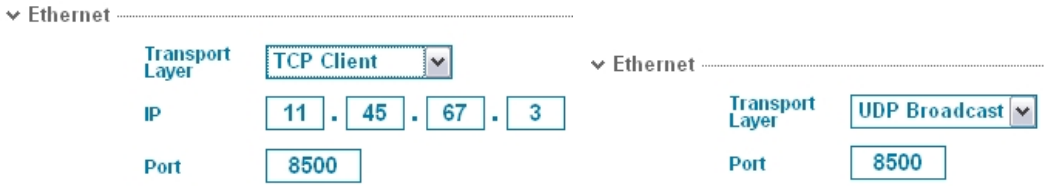
For each outgoing link, the parameters to be configured are as follows:

- Port number and type of link: a chart shows the eight available ports and the associated link. This enables you to choose the port and the type of link.
- **Protocol**: a list of protocols is available which allows compatibility between the USBL-BOX and other appliances. See the protocols in Appendix A.
- **Frequency**: the frequency of outgoing data is configurable. Values are presented in ms and Hz and range from **20 ms / 50 Hz** to **10,000 ms / 0.1 Hz**.
- **Serial**: if chosen link is **Serial**, the link parameters are as follows:
  - Parity: None, Odd, Even
  - Stop bites: 1.0 or 2.0
  - Standard: RS232 or RS422
  - **Baud output**: selected from a predefined list ranging from 600 to 115,200 bauds (output from port A is permanently fixed at 115,200 bauds)
- **Ethernet**: if the chosen link is **Ethernet**, the link parameters are as follows:
  - **Transport layer**: may be **TCP Server**, **TCP Client** or **UDP Broadcast**.
  - **IP**: the IP address of the target (only for a transport layer **TCP Client**)
  - **Port**: the number of the port

IV.4.2.2 Configuration Procedure

The configuration procedure of output data is detailed in this section.

Procedure

Step	Action
1.	Click on the **INSTALLATION** menu and select **OUTPUT**. *The **CONFIGURATION OF OUTPUT** window opens.* 
2.	Click on the port of your choice: **OUTPUT A, B, C, D, E, F, G** or **H** *The selected port is highlighted in blue. According to the type of link, the Serial or Ethernet component appears below.*
3.	In **Protocol**, Select the **Protocol** and the **Rate** of your choice from the pull-down list.
4.	If you have selected a **Serial** link, enter the parameters of this link: 
5.	If you have selected an **Ethernet** link, enter the parameters of the link: *According to the transport layer chosen, there may be an IP address for more information.* 
6.	Click on **OK** to validate your output configuration positioning data.
7.	End of Procedure.

V SETTING THE USBL-BOX TO WORK

This chapter concerns the actions and procedures to be carried out just before starting positioning operations. These actions are as follows:

- Definition of positioning parameters
- Configuration of transponders to be positioned
- Measurement and input of profile celerity of sound
- Configuration and recording of data
- Calibration of the USBL-BOX

V.1 Defining the USBL-BOX Survey Parameters

V.1.1 DEFINING THE TRACKING PARAMETERS

The parameters described in this paragraph enable the acoustic cycle of the USBL-BOX to be defined. The main parameter is the synchronization mode where the USBL-BOX is. Two synchronization modes are possible:

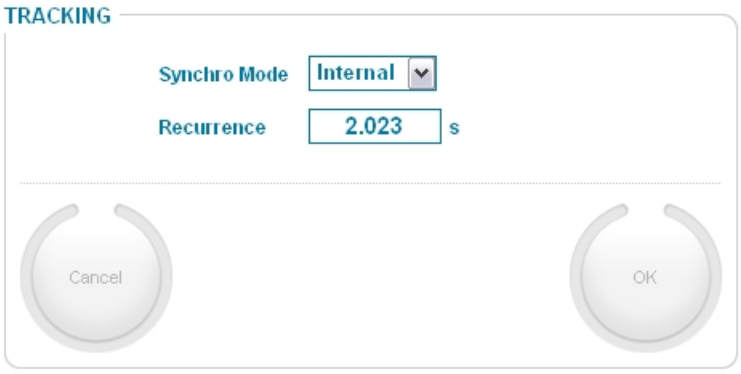
- Internal synchronization
- External synchronization

The configuration of positioning parameters is carried out in the **TRACKING** component from the menu **SETUP**.

V.1.1.1 Internal Synchronization

During internal synchronization, the USBL-BOX activates POSIDONIA's antenna emissions according to the defined value of recurrence. In this mode, the USBL-BOX can activate another acoustic appliance if the need arises.

Procedure

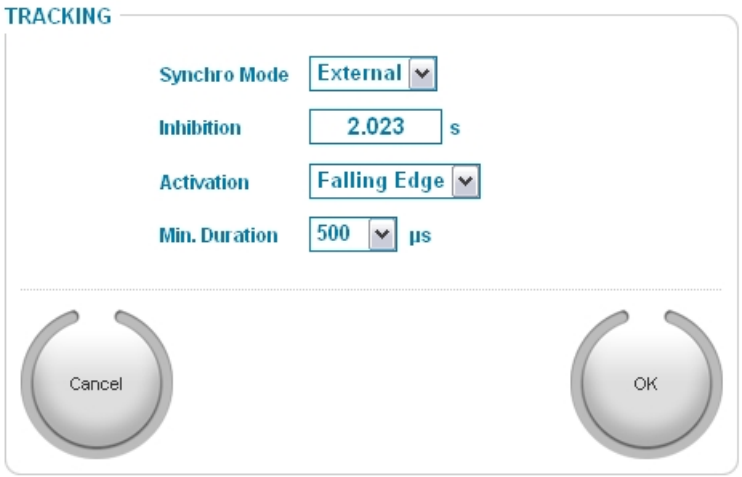
Step	Action
1.	Click on the menu **SETUP** and select **TRACKING**. *The **TRACKING** window opens.*
2.	Select **Internal** from the **Synchro Mode** pull-down list. *The **TRACKING** window shows the following parameters:* 
3.	Enter the value of **Recurrence**.
4.	Click on **OK** to validate the configuration of the internal synchronization mode.
5.	End of Procedure.

V.1.1.2 External Synchronization

During external synchronization, the acoustic emission of POSIDONIA's antenna is set off by an external appliance. This mode is generally chosen when the USBL-BOX is simultaneously operating with another acoustic appliance. A signal is sent to the USBL-BOX by one of the two specially designed BNC links situated at the front and at the back. The parameters associated with external synchronization are as follows:

- **Inhibition**: this is the time after setting off during which the USBL-BOX cannot receive other signals which could activate it at an untimely moment.
- **Activation**: this is the part of the signal where, on reception, the setting off takes place. Two options are possible: a rising edge or a falling edge of the signal.
- **Min. Duration**: this is the minimum length of time necessary for the setting off after activation by a rising or falling edge during which the signal must remain stable (high after a rising edge or low after a falling edge). Its values range from 50 µs to 1000 µs.

Procedure

Step	Action
1.	Click on the menu **SETUP** and select **TRACKING**. *The **TRACKING** window opens.*
2.	Select **External** from the **Synchro mode** pull-down list. *The **TRACKING** window shows the following parameters:* 
3.	Enter the **Inhibition** value.
4.	From the **Activation** pull-down list, choose the type of edge on which the acoustic emission is to be set off.
5.	Select the value of the **Min. Duration** from the associated pull-down list.
6.	Click on **OK** to validate your choices and to send this data to the USBL-BOX.
7.	End of Procedure.

V.1.2 SETTING UP THE TRANSPONDERS

The USBL-BOX positions the immersed transponders. Before starting positioning, you have to list, configure and activate the transponders via the web user interface.
You can access the management of transponders in the **TRANSPONDER** component from the **SETUP** menu. Transponders which are already present in the data base are listed in this window and you can see at a glance how these transponders were configured and whether they are still active or not. See the transponder window in Figure 27.

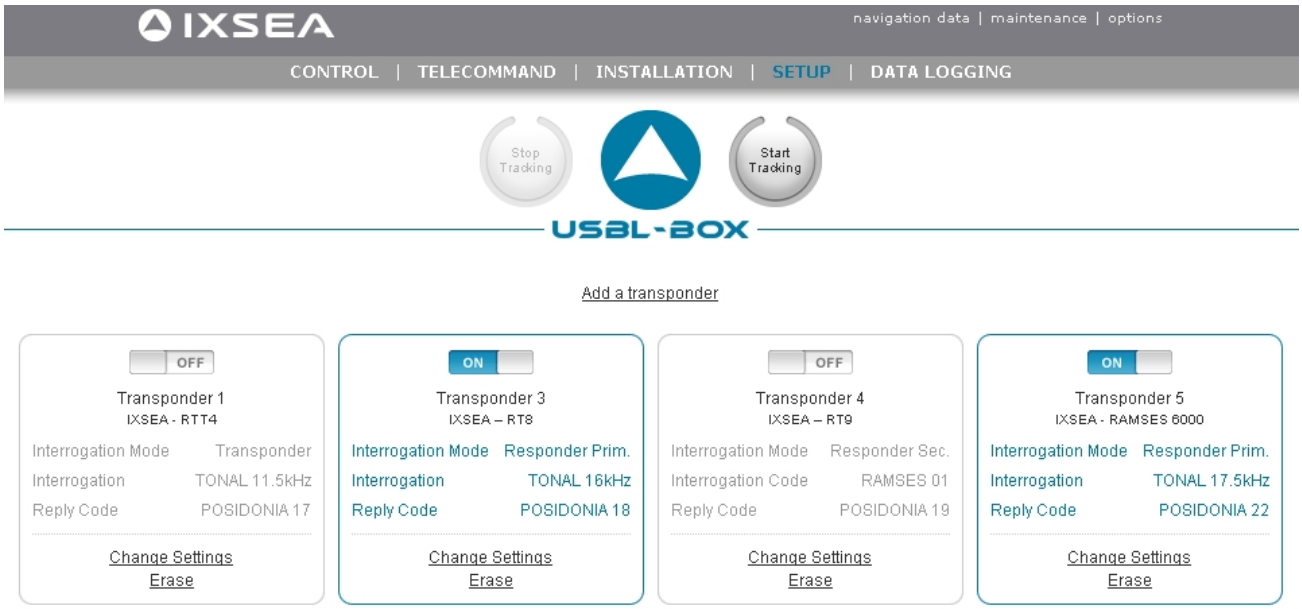


Figure 27 – Transponder window

From this window, you can carry out the following:

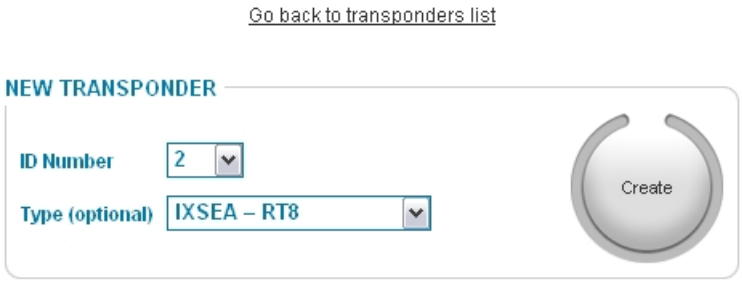
- Add a transponder to the list
- Configure a transponder
- Activate a transponder
- Remove a transponder from the list

V.1.2.1 Adding a Transponder

Each transponder is identified by an **Identifier**, a **Type** of transponder and a **Manufacturer**. Four types of transponder can be added:

- iXSea – RT8
- iXSea – RT9
- iXSea – RTT4
- iXSea – RAMSES 6000
- Generic (transponder not dedicated to any manufacturer)

Procedure

Step	Action
1.	Click on the menu **SETUP** and select **TRANSPONDERS**. *The management of transponders opens.*
2.	Click on **Add a transponder**. *The window shows:* 
3.	Choose an **ID Number** from the pull-down list. Only available identifiers are present.
4.	Select one of the transponders listed under **Type (optional)** and click on **Create.** *The configuration window opens.*
5.	Configure the transponder. See section V.1.2.2.
6.	Once the transponder is configured, click on **Go back to transponders list**.
7.	End of Procedure.

V.1.2.2 Configuring a Transponder

The USBL-BOX can position four different types of transponder:

- iXSea – RT9
- iXSea – RT8
- iXSea – RTT4
- iXSea – RAMSES 6000

The configuration parameters are classified under the following headings:

Interrogation

Interrogation comprises the **Mode** of acoustic positioning and the **Code** of interrogation that has been assigned to the transponder.

- **Mode:** can be **Responder** or **Transponder**. In **Answering Machine** mode the transponder is set off by an electrical signal and the transponder responds via acoustics. In **Transponder** mode, two outputs are possible: **MAIN** and **SECONDARY** and the interrogation and response are transmitted via acoustics.
- **Code**: defines a monochromatic signal from 8 kHz to 16 kHz by steps of 0.5 kHz or for RT9 and RAMSES 6000, a 10 ms MFSK low frequency signal from 0 to 23.

Reply

The heading **Response** comprises acoustic parameters characterizing the response of the transponder**.**

- **Code**: defines a low frequency MFSK signal lasting 25 ms numbered from 16 to 23.
- **Turn Around Time**: there is a period of inactivity between the interrogation signal first being received and the beginning of sending out the response emission. This time period is between 20 ms and 200 ms.
- **Blanking Time**: this is the length of time of transponder deafness after the response emission. This length of time helps avoid the transponder being set off at the wrong moment. It lasts between 1 and 31 s.

INHIBITION TIME MUST BE LESS THAN THE USBL-BOX RECURRENCE.

Information

Additional information can be an external pressure, a permanently immersed object or an acoustic pressure.

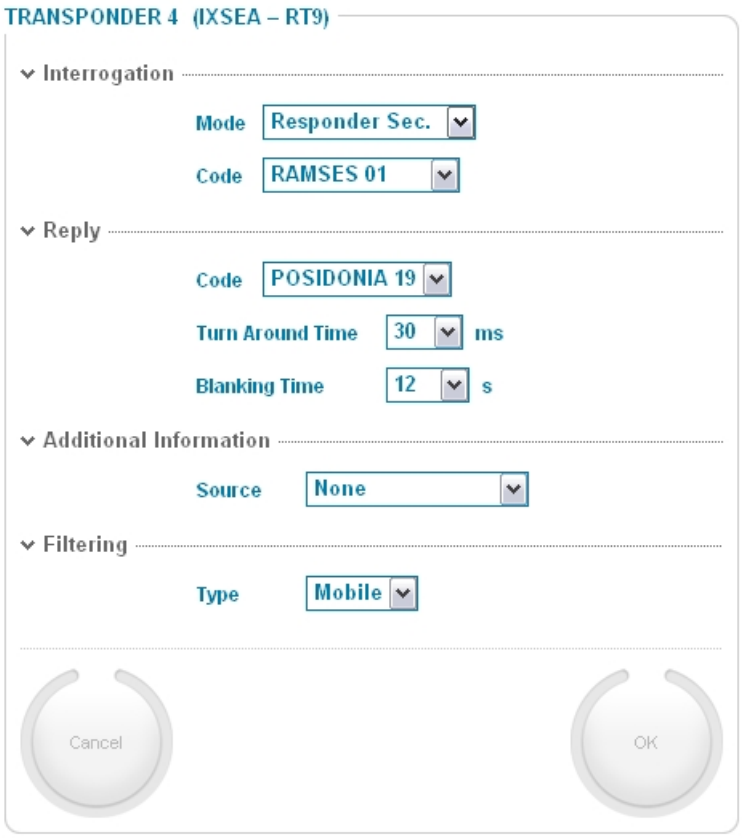
- **External Pressure**: this is pressure transmitted by a serial link through a pressure sensor. This sensor might be the one that equips the transponder or is already installed on the vehicle on which the transponder is to be loaded.
- **Fixed Depth:** is a depth of the transponder known in advance.
- **Acoustic Pressure**: is transmitted acoustically, the time factor between two response signals allows you to calculate the immersion measurements using a multiplying factor.

Filtering

The **filtering** heading enables you to apply a filter on positional data. Two options are available (**Fixed** and **Mobile**).

The filtering heading enables you to apply a filter for positional data. Two options **Fixed** and **Mobile** are available depending on whether the transponder's position is static (anchored) or moving (on an underwater vehicle).

Procedure

Step	Action
1.	Click on the **SETUP** menu and select **TRANSPONDERS**. *The transponders management window opens.*
2.	Click on **Change Settings** for the appropriate transponder to be configured. *The configuration window opens. The image shown corresponds to an RT9 transponder.* 
3.	In **Interrogation**, select **Mode** and **Code** from the drop-down lists.
4.	In **Reply**, select **Code**, **Turn Around Time** and **Blanking Time** from the drop-down lists.
5.	In **Additional Information**, select **Source** from the drop-down list. • If you select **External Pressure**, you must input a **Pressure** value. • If you select **Fixed Immersion**, you have to enter the value of **Immersion** together with the associated **Pressure**.
6.	In **Filtering**, select the **Type** of filter from the drop-down list.
7.	Click on **OK** to validate your choices and to send the data to the USBL-BOX.
8.	End of Procedure.

V.1.2.3 Activating a Transponder

A transponder which is present in the database must be activated before being able to be positioned.

Procedure

Step	Action
1.	Click on the menu **SETUP** and select **TRANSPONDERS**. *The transponders management window opens.*
2.	Click on depending on which transponder you would like to activate. *The button becomes* *. The transponder is activated.*
3.	End of Procedure.

V.1.2.4 Deleting a Transponder

A transponder can be removed from the transponder list.

Procedure

Step	Action
1.	Click on the **SETUP** menu and select **TRANSPONDERS**. *The transponders management window opens.*
2.	Click on **Erase** depending on which transponder you wish to delete. *The transponder disappears. The transponder has been deleted.*
3.	End of Procedure.

It is not possible to delete the last transponder.

V.1.3 ENTERING THE SOUND VELOCITY PROFILE

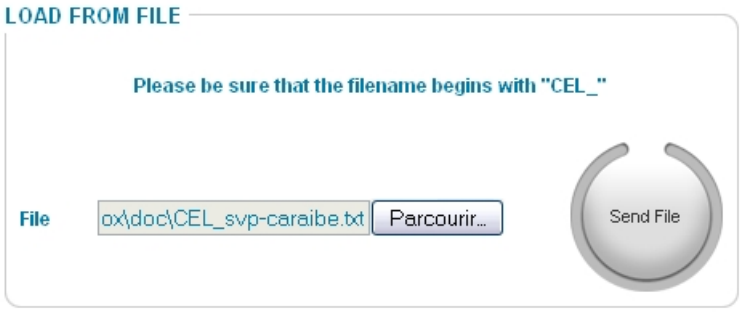
V.1.3.1 Loading a Profile from a File

It is also possible to load a file containing the sound velocity profile in the Web-based user interface. The format of this file must respect the following rules:

- The file is in ASCII format.
- The name of the file must start by “CEL_”.
- The two first numbers of each line of the file are read like the depth and velocity. The other numbers after these first two are ignored.
- Any separator can be used to separate the two values of depth and velocity.
- The depth must be in meters and the velocity in meters per second.
- The depth must be increasing from one line to the other. If it is not the case, the file is sorted out to have a strictly increasing series of depth.
- The data over limits are ignored.

Procedure

Step	Action
1.	Click on **Browse…** and select the file containing the sound velocity profile.



2.	Click on **Send File**. *The file is read and the depth and velocity data are displayed in the table.*
3.	End of Procedure.

V.1.3.2 Entering a Profile Manually

Speed profile

The USBL-BOX measures the angle and the signal time between the acoustic antenna and the immerged transponder. In order to convert the data into distance time, you have to know the speed of the sound in the entire water column. An operator equipped with a sounding line takes this measurement at the beginning of the mission. The corresponding values are then entered into the system via the Web-based user interface so that the necessary calculations can be carried out as accurately as possible. These values comprise data concerning both depth and speed.

Input

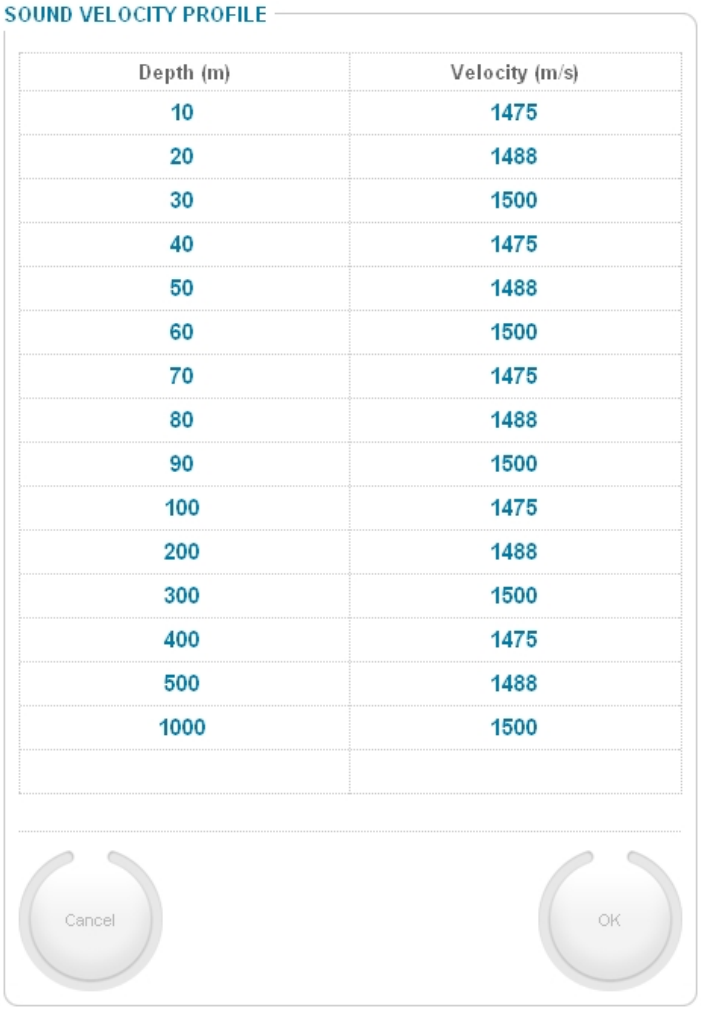
Therefore you have to input data concerning

- **Depth (m)**
- **Velocity (m/s)**

Procedure

Step	Action
1.	Click on **SETUP** and select **SPEED PROFILE**.

An editable speed profile will be shown:



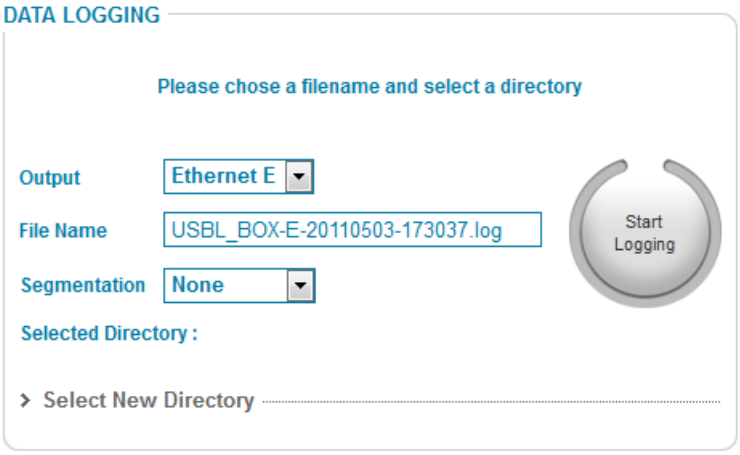
Step	Action
2.	Click on the first line of the **Depth (m)** column.
3.	Enter the valid depth value (between 0 and 10,000m)
4.	Click on [Tab]. *The velocity corresponding to the depth value entered is highlighted.*
5.	Enter the new velocity value (between 1,400 and 1,600m) corresponding to the entered depth.
6.	Click on [Tab]. *The depth value of the following line is highlighted.*
7.	Go back to step 3 until you have entered all the couples depth and velocity from your profile.
8.	Click on **OK** to validate your choices and to send this data to the USBL-BOX.
9.	End of Procedure.

One value which is outside validity will appear in **red**. It will be impossible for you to validate the speed profile before replacing these values with valid data.

V.1.4 LOGGING DATA

In this section, the recording of data coming from an **Output** (set up in section IV.4.2) port is configured. Choose the **Name of the File**. You can choose to create a new file after a certain time of after the previous file has reached a certain size (**Segmentation**). Choose the **selected directory** on your hard disk where the data is stored.
The name of the file is automatically generated with the date and time
`USBL_BOX-aaaammjj_hhmmss.log`
(aaaa: year, mm: month, jj: day, hh: hour, mm: minute, ss: second)

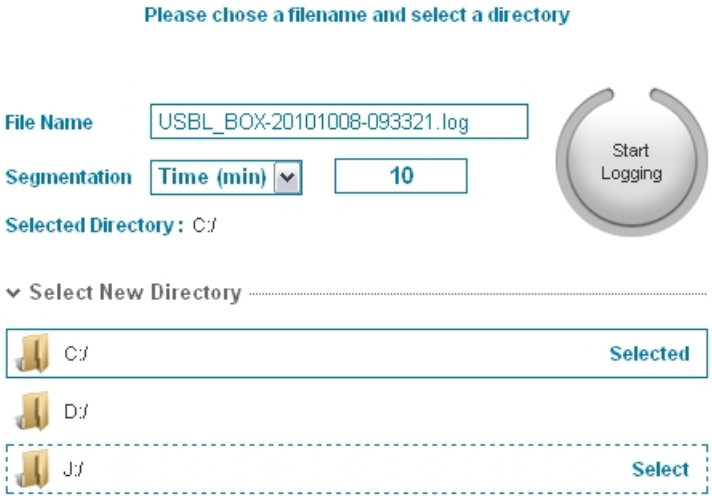
Procedure

Step	Action
1.	Click on **DATA LOGGING.** *A security window may open (the first time you click on this button after having installed the Java platform).* • Select **Always trust this editor.** • Click **Go**. *The following page appears:* 
2.	Select an **Output** port in the scrolling list.
3.	You can change the **File Name** which is automatically generated by typing the new name directly in the dedicated field. This name must consist of alphanumeric characters (inverted commas " _ " is accepted) with no space between the characters.
4.	You can choose to have the following kind of files: Fixed size: choose **Size (ko)** from **Segmentation** and enter the chosen size in the text box. Temporal fixed length: choose **Time (mins)** from the **Découpage** field and enter the chosen temporal length in minutes in the text box to the right of the **Découpage** field.

Step	Action

5. Click on **Select New Directory** to explore and select the directory where you would like to record the selected data (at any time you can go back to the original directory), then click on the button **Choose** to validate the chosen directory.

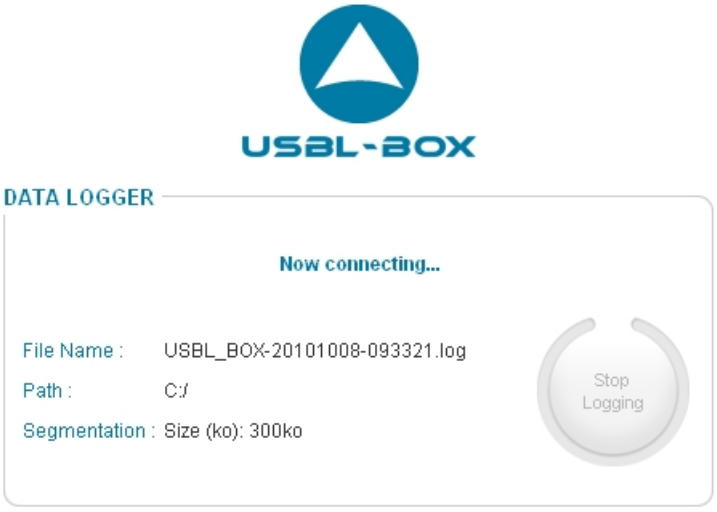
   *The chosen directory appears below the **Selected Directory** field.*



6. Click on the **Start Logging** button to begin recording.

   *Recording starts and a separate **DATA LOGGER** window open. This shows the file name, together with the directory where the file is recorded and the chosen **Segmentation**.*

   *At any time you can stop the recording by clicking the **Stop** button.*



   Do not close the DATA LOGGER window otherwise you stop the data recording.

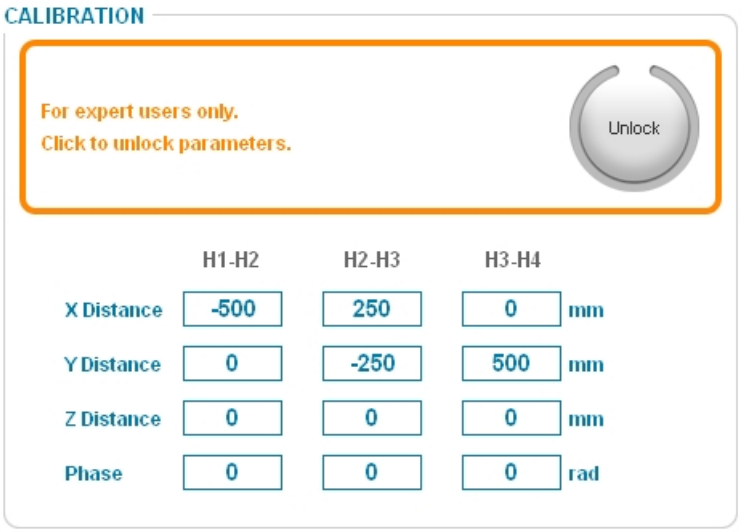
7. End of Procedure.

V.2 Calibrating the USBL-BOX

The calibration procedures of the POSIDONIA acoustic antenna can be found in the specific user manual of the POSIDONIA acoustic antenna.
Once the angular offsets have been computed, you need to input these offsets in the USBL-BOX Web-based user interface:

Procedure

Step	Action
1.	Click on the **INSTALLATION** menu and select **ANTENNA CALIBRATION.**
2.	Click on **Unlock** to make the input possible.
3.	For each line **X Distance, Y Distance, Z Distance**, input the three distances between **H1-H2**, **H2-H3** and **H3-H4**.
4.	Let the Phase to zero. This parameter is dedicated to an future use.
5.	Click on **OK** to validate your choice and to send this data to the USBL-BOX.
6.	End of Procedure.



VI OPERATING THE USBL-BOX

VI.1 Deploying the Transponders

The transponder to be positioned is either mobile on an underwater vehicle or attached to a mooring.

The deployment of an underwater vehicle is specific to that particular vehicle.

The deployment of a transponder attached to a mooring.

VI.2 Launching the Survey

Procedure

Step	Action
1.	If this is the first mission, calibrate the POSIDONIA antenna after having installed it or after the vessel has passed through dry dock. See the antenna calibration procedure in section V.2. Enter the non-alignments, immersion and lever arms from section IV.3.
2.	Configure (or check if it has already been done) the USBL-BOX network interface. See the section IV.2.
3.	Configure the USBL-BOX input and output if there are new sensors during this mission. See section IV.4.
4.	Configure the synchronization mode and its associated parameters. See section V.1.1
5.	Configure the transponders which are going to be positioned during the mission. See section V.1.2.
6.	Enter the speed profile. See chapter V.1.3.
7.	Configure the data acquisition. See section V.1.4.
8.	Click on **Start Tracking**. *The data acquisition window opens and acquisition starts.*
9.	Open the navigation window in order to check the acquired data. See section VI.3.
10.	Start the mission.
11.	End of Procedure.

VI.3 Controlling the Data

VI.3.1 Data Control Windows

Controlling data from the USBL-BOX is carried out via the navigation window, the main window with detailed information shown together and with the data recording window.

- On the main window:
  - Detailed information
  - Messages shown under the heading STATUS
- On the navigation window:
  - Navigation data: attitude sensor, position, temperature data both from the system and the acoustics
  - Positioned transponder data (see Table 3)

Table 3 – Displayed data for each active transponder

Data	Definition
Latitude	Geographic coordinates of the transponder
Longitude	
Depth	Depth computed with acoustic data and data from optional external sensors
Sensor depth	Depth provided by optional external sensors
X Rel. Antenna	Transponder coordinates with respect to the frame centered on the antenna and to the antenna axes
Y Rel. Antenna	
X Rel. North	Transponder coordinates with respect to the frame centered on the antenna and to the geographical axes
Y Rel. North	
Slant Range	Traveled distance
H. Distance	Horizontal distance
Bearing	Transponder angle seen from the antenna with respect to the along track axe of the ship
Azimuth	Transponder angle seen from the antenna with respect to the North
Vertical Angle	Transponder angle seen from the antenna with respect to the vertical
SNR	Signal to noise ratio
Travel Time	Travel time of the acoustic wave to reach the transponder

- On the recorded data window:
  - The name of the current data file which changes according to the chosen segmentation
  - The recording status of the tracked transponders

During the tracking, repetitive clicks on the main iXSea logo or on the **STATUS** label on the left of the main logo display alternatively the **SYSTEM DETAILED STATUS** and the list of the active transponders and their associated parameters. A click on the frame of a transponder of the list allows the display of another set of parameters of the transponder.

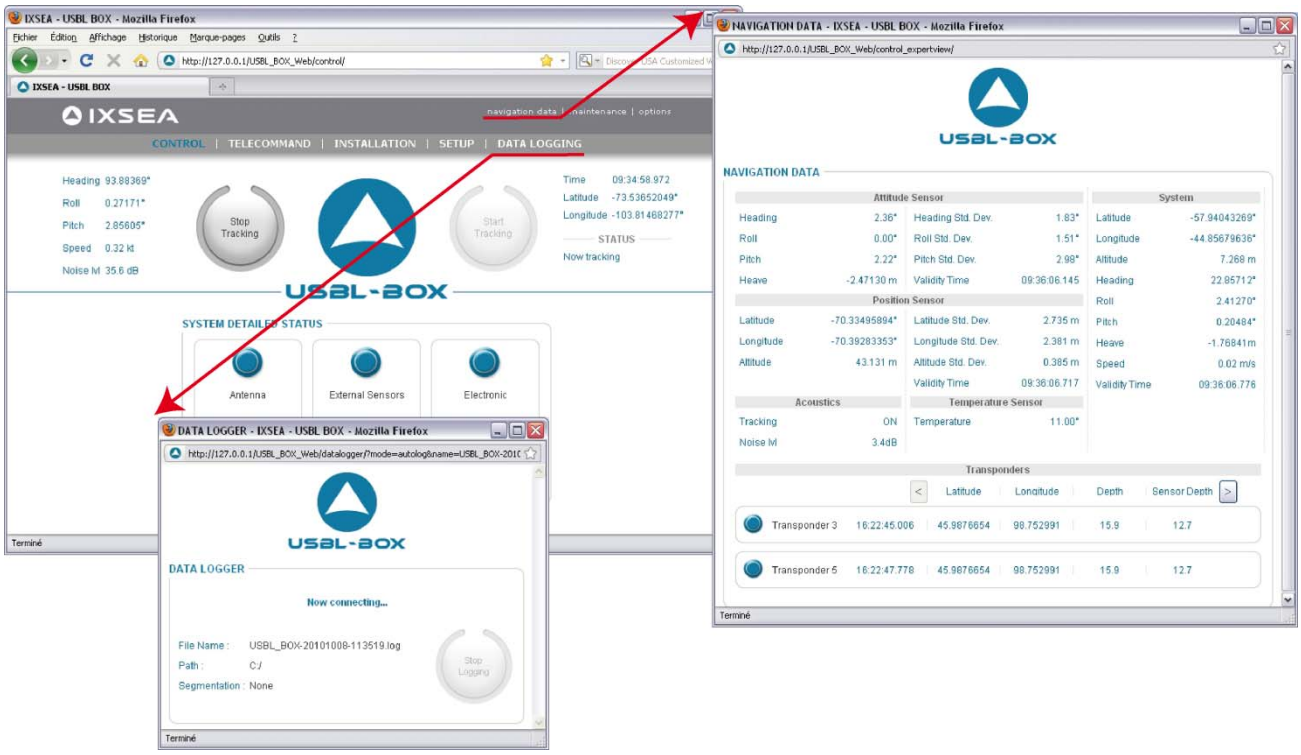

IXSEA - USBL BOX - Mozilla Firefox
CONTROL | TELECOMMAND | INSTALLATION | SETUP | DATA LOGGING
USBL-BOX
SYSTEM DETAILED STATUS
Antenna
External Sensors
Electronic
DATA LOGGER - IXSEA - USBL BOX - Mozilla Firefox
DATA LOGGER
Now connecting...
NAVIGATION DATA - IXSEA - USBL BOX - Mozilla Firefox
NAVIGATION DATA
Transponders

Figure 28 – Data control windows

VI.3.2 LIST OF THE STATUS IN THE WEB USER INTERFACE

Blue Message: information
Orange Message: warning
Red Message: error

Message	Meaning	Action
USBL-BOX Sensor		
Input A/B/C/D/E/F/G/H – not talking	The system is not receiving any data on channel A/…/H.	Check the channel configuration, the physical connection and the data source.
Input A – Corrupted data	Data received but consistency and integrity tests fail.	Check the quality of serial links.
USBL-BOX System		
5V analog supply	Internal electrical problem	Switch off the rack and contact iXSea.
5V digital supply	Internal electrical problem	Switch off the rack and contact iXSea.
12V analog supply	Internal electrical problem	Switch off the rack and contact iXSea.
Clock updating	System time is not up to date	Configure a UTC sensor.
DSP communication	Internal problem coming from the signal processing module.	Switch off the rack and turn it on again. If the problem remains, contact iXSea.
DSP configuration	Internal problem coming from the signal processing module.	Switch off the rack and turn it on again. If the problem remains, contact iXSea.
Signal processing	Internal problem coming from the signal processing module.	Switch off the rack and turn it on again. If the problem remains, contact iXSea.
USBL-BOX Antenna		
Transponder interrogation	The system is not triggered.	Check that the synchro is sent to the rack.
Sampling	Internal problem coming from the signal processing module.	Switch off the rack and turn it on again. If the problem remains, contact iXSea.
Maximum range	One or several detections are close to the end of the acquisition period.	Increase the interrogation rate.
Channel 1/2/3/4 detection	The system does not detect the signal coming from the transponder on the channel 1/2/3/4	If the message appears for a short time, it may be due to the external environment. If the problem remains continuously, there might be a problem with the antenna or with the antenna cable. Contact iXSea.

TRANSPONDERS		
No detection	The system does not track the transponder.	If the message appears for a short time, it may be due to the external environment. If the problem remains continuously, check the consistency of the transponder configuration input in the Web-based user interface.
No position	The signal detections do not allow the computation of a position.	If the message appears for a short time, it may be due to the external environment.
Filter not updated	The computed position has been rejected.	
RAZ Filtre	The filter has been re-initialized because of consecutive rejections.	
Antenna not calibrated	The antenna is not calibrated.	Report to the calibration section of this manual. See section 49V.2.

VI.4 Recovering the Equipment

VI.4.1 PRINCIPLE

Telecommand

This section describes the recovering of the transponders. The moored transponders are recovered with the use of the telecommand function of the USBL-BOX. The iXSea TT801 telecommand can also perform this duty.

VI.4.2 OPERATING MODE

Recovering

The telecommand transmits a signal to the transponders. Once the signal received by the transponder, the transponder answers by an acknowledgment signal (CAF). The hook engine rotates, freeing the release ring and the weight. Another acknowledgement signal is transmitted by the transponder after the complete rotation of the engine. The transponder starts to go up towards the surface carried by the buoys. The upward speed is typically 1 to 2 m/s. The transponders can now be recovered at the sea surface.

Before any recovery operation, click on the **Stop tracking** button. The POSIDONIA antenna must not be pinging while the telecommand is operating.

The USBL-BOX can send commands to the transponders. Two types of commands exist and are coded respectively in 8 and 24 bits. The 24-bits coded commands are exclusivemy dedicated to the RTT400. In order to configure these commands, you need to input the following parameters, see sections VI.4.2.1 and VI.4.2.2.

VI.4.2.1 8-bits Commands

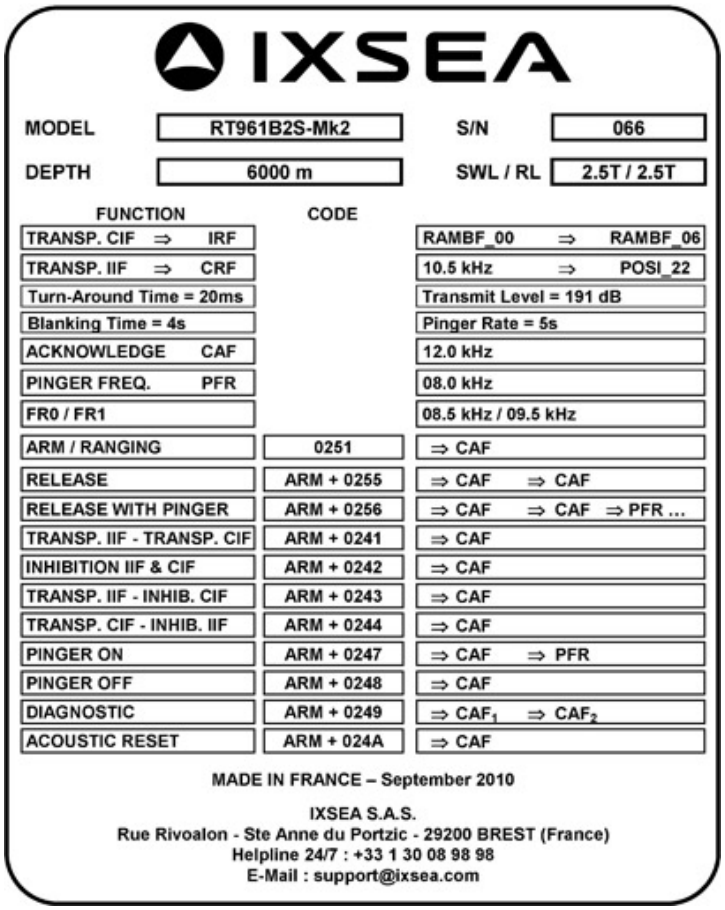
- **Bit0** and **Bit1**: two frequencies defining the 0 and 1 values of the coded signals
- **CAF**: acknowledgment signal send by the transponder
- **ARM**: hexadecimal value of the arming command that wakes the transponder up
- **CMD**: hexadecimal value of the command
- **Acknowledgment Timeout**: from 1 to 60 s in which the device waits for an acknowledgement signal of the command from the transponder

Transponder Label

The codes of the commands can be found on the manufacturer label stuck on the transponder. See an example of such a label on Figure 29. These codes are expressed in hexadecimal format. The Table 4 links the hexadecimal values to the code numbers.

Table 4 – Correspondence between frequencies and hexadecimal codes

Code	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Freq. kHz	8.5	9	9.5	10	10.5	11	11.5	12	12.5	13	13.5	14	14.5	15	15.5	16



IXSEA

MODEL	RT961B2S-Mk2	S/N	066
DEPTH	6000 m	SWL / RL	2.5T / 2.5T

FUNCTION	CODE	
TRANSP. CIF ⇒ IRF		RAMBF_00 ⇒ RAMBF_06
TRANSP. IIF ⇒ CRF		10.5 kHz ⇒ POSI_22
Turn-Around Time = 20ms		Transmit Level = 191 dB
Blanking Time = 4s		Pinger Rate = 5s
ACKNOWLEDGE CAF		12.0 kHz
PINGER FREQ. PFR		08.0 kHz
FR0 / FR1		08.5 kHz / 09.5 kHz
ARM / RANGING	0251	⇒ CAF
RELEASE	ARM + 0255	⇒ CAF ⇒ CAF
RELEASE WITH PINGER	ARM + 0256	⇒ CAF ⇒ CAF ⇒ PFR ...
TRANSP. IIF - TRANSP. CIF	ARM + 0241	⇒ CAF
INHIBITION IIF & CIF	ARM + 0242	⇒ CAF
TRANSP. IIF - INHIB. CIF	ARM + 0243	⇒ CAF
TRANSP. CIF - INHIB. IIF	ARM + 0244	⇒ CAF
PINGER ON	ARM + 0247	⇒ CAF ⇒ PFR
PINGER OFF	ARM + 0248	⇒ CAF
DIAGNOSTIC	ARM + 0249	⇒ CAF_1 ⇒ CAF_2
ACOUSTIC RESET	ARM + 024A	⇒ CAF

MADE IN FRANCE – September 2010

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Rue Rivoalon - Ste Anne du Portzic - 29200 BREST (France)
Helpline 24/7 : +33 1 30 08 98 98
E-Mail : support@ixsea.com

Figure 29 – Transponder build sheet example of a RT961B2S-Mk2

VI.4.2.2 24-bits Commands

The specific characteristics of the 24-bits commands are the following:

- Synchronization impulse frequency (Synchro) adding itself to the Bit0, Bit1 and CA, emitted before the actual transmission of the 24 bits.
- The command message itself comprises three bytes:
  - An address to assign the transponder to be ordered, **Beacon**
  - An information defining the task to be achieved, **Instruction**
  - A parameter, **Parameter**

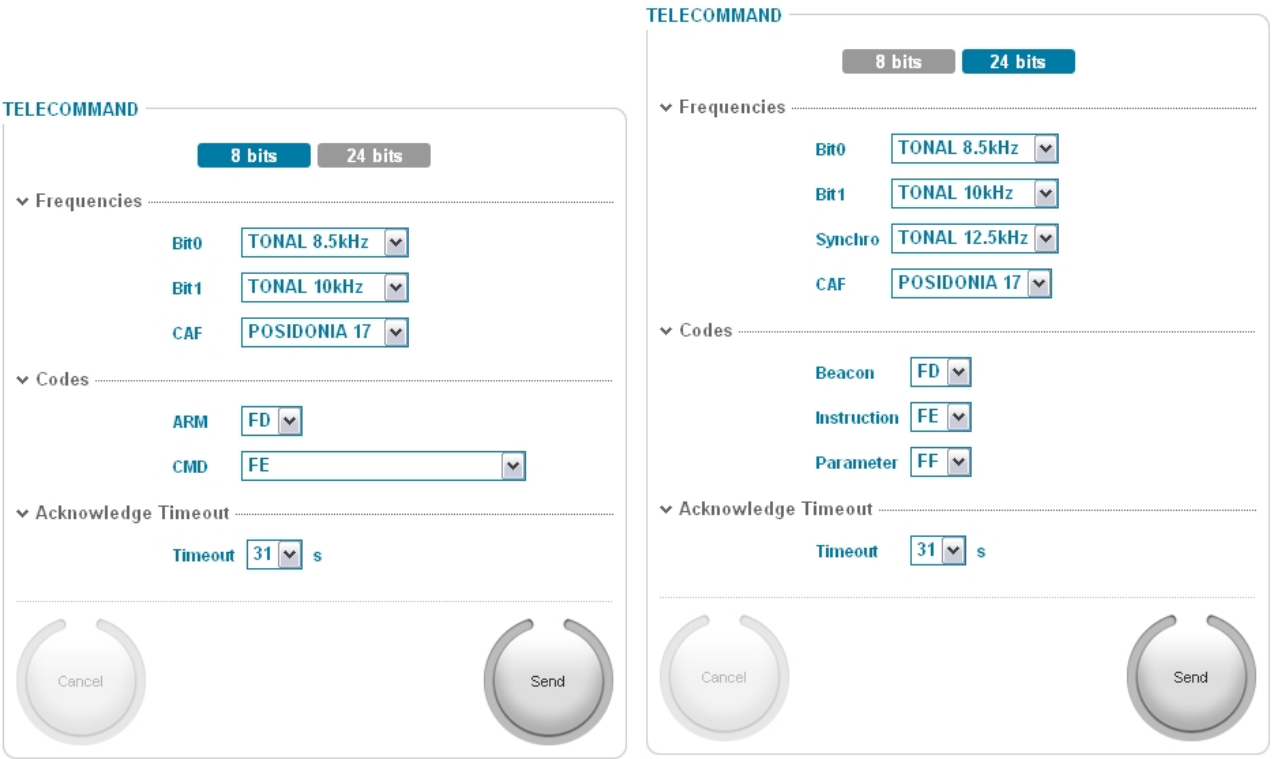


Figure 30 – 8 bits and 24 bits TELECOMMAND window

Procedure

Step	Action
1.	Click on **TELECOMMAND**. *The **TELECOMMAND** window opens. See Figure 30.*
2.	Choose the type of command to be sent, the 24-bits coded commands are exclusively dedicated to the RTT400 transponders.
3.	Under **Frequencies**: In **8 bits**, select the **Bit0**, **Bit1** and **CAF** in the corresponding drop-down lists. In **24 bits**, after the **Bit0**, **Bit1** and **CAF** parameters, select the **Synchro** frequency.
4.	Under **Codes**: In **8 bits**, select the codes **ARM** and **CMD** in the corresponding drop-down lists. In **24 bits** select the **Beacon**, **Instruction** and **Parameter** in the corresponding drop-down lists.
5.	Under **Acknowledgment Timeout**, select the **Timeout**.
6.	Click on **OK** to validate your choice and to send the parameters to the USBL-BOX.
7.	End of Procedure.

VII MAINTENANCE

VII.1 Maintenance from the Web-Based User Interface

You have access to a series of four maintenance tasks from the Web Based User Interface. These four tasks are:

- Update the System
- Reset to factory settings
- Contact iXSea technical Support
- Gain Stop mode to perform analogical tests on the antenna

VII.1.1 UPDATING THE SYSTEM

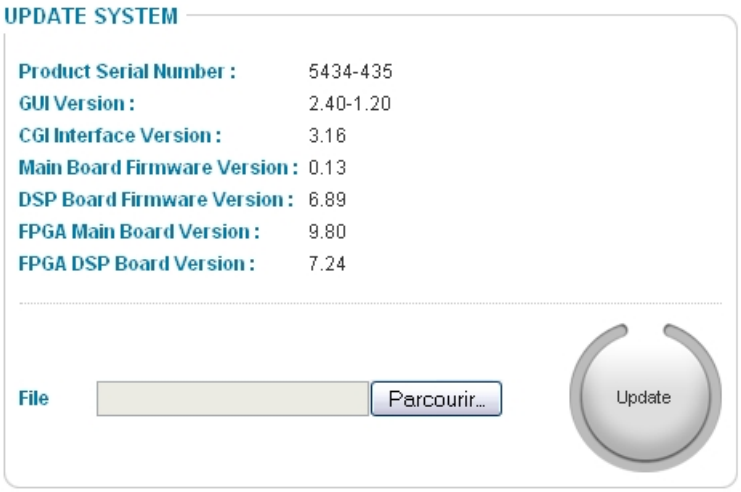
You update your system with an update file that iXSea provides to you when a new version is available.

The update file names have:

- ".srec" or ".sre" extension
- "TQ_" prefix for the mother board
- "G4W_" for the signal processing board

You upload this file from your computer directly inside USBL-BOX via the present procedure.

Procedure

Step	Action
1.	Click on **maintenance** in the upper right corner of the window. 
2.	In front of **File**, click on the **Browse** button. *A browser opens.*
3.	Select the update file "`.srec`" that iXSea sent to you.
4.	Click on **Update**. *The iXSea logo flashes alternatively gray and blue. A **Sending file** label appears in the UPDATE SYSTEM area. After a while the file is uploaded and the updating is complete.*
5.	Check that all the versions numbers listed above the Update button are actually updated.
6.	End of Procedure.

VII.1.2 RESETTING TO THE FACTORY SETTINGS

Sometimes it can be useful to reset the system to the factory settings. These settings are set as default settings when the USBL-BOX unit is shipped to you by iXSea. You just have to press the **Reset** button in the **RESET TO FACTORY SETTINGS** area.

Figure 31 – Reset to factory settings

VII.1.3 CONTACTING IXSEA TECHNICAL SUPPORT

You can always contact iXSea by your own ways with the coordinated listed at the end of this document. However, the Web Based User Interface offers to you a more convenient way to contact iXSea technical support.

CONTACT SUPPORT
Click to create a support ticket.
To join the system configuration, click here and attach the file to the support ticket email.
Contact Support

Figure 32 – Contact support

E-mail

By clicking on the **Contact Support** button in the **CONTACT SUPPORT** area, you send an email to iXSea technical support with all related information of your system (Product name and serial number and other information that you can fill in the corresponding fields).

Configuration File

If you click on **click here** link, you save a file configuration that you can add to the email that you send to iXSea technical support. This tool gives to the iXSea technical support as much information as possible to help you to answer a question or to overcome an eventual problem.

VII.1.4 GAIN STOP MODE

You can adapt the gain to make analog measurements on the antenna. This tool can only be used when the tracking is stopped.

Enter a **Gain** value going from 0 to 80 dB and click on **Apply**.

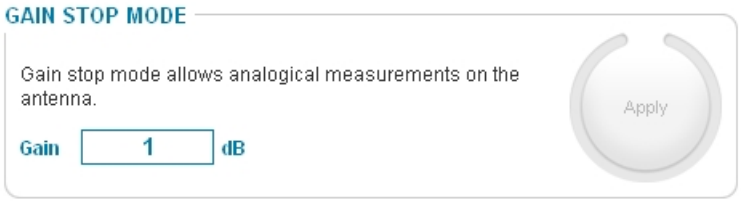


Figure 33 – Gain adjustment in Gain Stop mode

Customer Support

Customer's technical support on this product is available:

- by e-mail : **support@ixsea.com**
- by phone through iXSea 24/7 hot-line :
  - +33 (0)1 30 08 98 98 for EMEA
  - +1 888 660 8836 (toll free) for US
  - +65 6747 7027 for Asia

iXSea customer's support commits to provide a quick response to your query.

Contact

To obtain information on any iXSea product, you can contact iXSea headquarters in France, or one of its offices around the world:

Contact	Phone	Fax
iXSea SAS FRANCE	+33 1 30 08 98 88	+33 1 30 08 88 01
iXBlue BV THE NETHERLANDS	+31 23 750 5110	+31 23 750 51 11
iXBlue GmbH GERMANY	+49 511 123 59575	+49 511 123 59576
iXBlue NORWAY	+47 55 91 33 60	
iXBlue Ltd UNITED KINGDOM • Portsmouth • Aberdeen Office	 • +44 2392 658 252 • +44 1224 355 160	 • +44 2392 658 253 • +44 1224 826 622
iXBlue LLC UNITED ARAB EMIRATES	+971 4 3117135	+971 4 3328860
iXBlue Inc U.S.A. • Boston • Houston	 • +1 781 937 8800 • +1 281 681 9301	 • +1 781 937 8806 • +1 281 362 2704
iXBlue Pte Ltd SINGAPORE	+65 6747 4912	+65 6747 4913
iXBlue Pte Ltd CHINA	+86 10 6211 4716	+86 10 6211 4718
iXBlue Pty Ltd AUSTRALIA	+61 7 3390 4660	+61 7 3390 7242

A detailed description of our products and a list of our representatives are available on our website: www.ixsea.com

Appendices

A. OUTPUT PROTOCOLS

A.1 DATA STANDARD

The DATA Standard protocol is composed of the three iXSea Posidonia positioning messages $PTSAG, $PTSAX and $PTSAY plus all the messages of the PHINS Standard protocol.

Transponder Absolute Positioning Message (geographical coordinates and depth)

$PTSAG,#NNNNN, hhmmss.sss,jj,mm,aaaa,BBB,DDMM.MMMMM,H,DDDMM.MMMMM,D,A,MMMM.M,A, MMMM.M *CK	
#NNNNN	Recurrence frame Number
hhmmss.ss	is the time in hours, minutes, seconds ,milliseconds
jj	is the day (jj = 0 to 31)
mm	is the month (mm =1 to 12)
aaaa	is the year
BBB	is the Transponder No. or ship's No 0: Ship 1 to 128: Transponder -128 to –1: Unknown Transponder
DDMM.MMMMM	is the latitude degrees, minutes and 1/100000
H	is the hemisphere (N: North, S: South)
DDDMM.MMMMM	is the longitude degrees, minutes and 1/100000
D	is the longitude direction (E: East, W: West)
A	is the validity of the four reception channels 0 to F: binary coding of acoustic hydrophone validity
MMMM.M	is the calculated depth in meters
A	is the depth validity 0: None 1: Calculated 2: Sensor
MMMM.M	is the sensor depth in meters

- Position validity: The value represents the acoustic hydrophone validity on 4 bits (from 0000 to 1111). 0 means that the channel is not valid and 1 that the hydrophone operates properly.
- Calculated depth / Sensor depth: The antenna know only one depth that is the fusion of both depths (Calculated and sensor). This "optimized" depth is in the "Calculated depth" field.
- Sensor depth: if the Acoustic Transponder has no sensor, the value is 9999.
- In case of ship, the three last fields are set to zero.

Transponder relative Positioning Message relative to the acoustic array (Relative coordinates and depth)

$PTSAX,#NNNNN, hhmmss.sss,jj,mm,aaaa,BBB, XXXXX.X, YYYYY.Y,A,PPPP.P,A,CCCC.C *CK	
#NNNNN	Recurrence frame Number
hhmmss.ss	is the time in hours, minutes, seconds ,milliseconds
jj	is the day jj = 0 to 31
mm	is the month mm =1 to 12
aaaa	is the year
BBB	is the Transponder No.
	1 to 128: Transponder
	-128 to –1: Unknown Transponder
XXXXX.X	is the X coordinate (+ forward) in meters
YYYYY.Y	is the Y coordinate (+ starboard) in meters
A	is the position validity (X, Y, Z)
	0 to F: binary coding of acoustic channel validity
PPPP.P	is the calculated depth in meters
A	is the depth validity
	0: None 1: Calculated 2: Sensor
CCCC.C	is the sensor depth in meters

- Position validity: The value represents the acoustic Channel validity on 4 bits (from 0000 to 1111). 0 means that the channel is not valid and 1 that the channel operates properly.
- Calculated depth / Sensor depth: The sensor know only one depth that is the fusion of both depths (Calculated and sensor). This “optimized” depth is in the “Calculated depth” field.
- Sensor depth: if the Acoustic Transponder has no sensor, the value transmitted is 9999.

THE X AND Y POSITIONS ARE RELATIVE TO THE ACOUSTIC ARRAY.

Transponder Relative Positioning Message relative to the sensor – NORTH orientation (Relative coordinates and depth)

$PTSAY,#NNNNN, hhmmss.sss,jj,mm,aaaa,BBB,XXXXX.X, YYYYY.Y,A,PPPP.P,A,CCCC.C *CK	
#NNNNN	Recurrence frame Number
hhmmss.ss	is the time in hours, minutes, seconds ,milliseconds
jj	is the day jj = 0 to 31
mm	is the month mm =1 to 12
aaaa	is the year
BBB	is the Transponder No.
	1 to 128: Transponder
	-128 to –1: Unknown Transponder
XXXXX.X	is the X coordinates (positive northwards) in meters
YYYYY.Y	is the Y coordinates (positive eastwards) in meters
A	is the position validity (X,Y, Z)
	0 to F: binary coding of acoustic channel validity
PPPP.P	is the calculated depth in meters
A	is the depth validity 0: None 1: Calculated 2: Sensor
CCCC.C	is the sensor depth in meters

- Position validity: The value represents the acoustic Channel validity on 4 bits (from 0000 to 1111). 0 means that the channel is not valid and 1 that the channel operates properly.
- Calculated depth / Sensor depth: The sensor know only one depth that is the fusion of both depths (Calculated and sensor). This “optimized” depth is in the “Calculated depth” field.
- Sensor depth: if the Acoustic Transponder has no sensor, the value transmitted is 9999.

THE X AND Y POSITIONS ARE RELATIVE TO THE ACOUSTIC ARRAY

Data sent: Latitude, Longitude of the ship or sensor, GPS quality

$GPGGA,hhmmss.ss,ddmm.mmmmm,a,dddmm.mmmmm,b,q,ss,...,…,.,…,.,…,….*hh<CR><LF>	
hhmmss.ss	is the UTC of position
ddmm.mmmmm	is the latitude in degrees and in minutes and 1/100000
a	is the hemisphere N: North S: South
dddmm.mmmmm	is the longitude in degrees and in minutes and 1/100000
b	is longitude sign (E: East, W: West)
q	is the GPS quality indicator • 0 Fix not valid • 1 GPS SPS Mode fix valid • 2 Differential Mode, SPS Mode, fix valid • 3 GPS PPS Mode, fix valid • 4 RTK • 5 Float RTK
ss	is the number of satellites
*hh	is optional

Data sent: Course Over Ground and Ground Speed

$GPVTG,x.x,T,x.x,M,x.x,N,x.x,K,a*hh<CR><LF>	
x.x,T	Course over ground, degrees True
x.x,M	Course over ground, degrees Magnetic
x.x,N	Speed over ground, knots
x.x,K	Speed over ground, km/h
a*hh	Mode Indicator (A autonomous mode, D differential mode, E estimated mode, M manual input mode, S simulator mode, N Data not valid, never null)

A.2 DATA LIGHT

The DATA LIGHT protocol contains only the strings PTSAG, PTSAX et PTSAY that are already present in the DATA STANDARD protocol.

A.3 HIPAP HPR 400

Field	Name	Kongsberg Explanation	
$	Start Character		$
PSIMSSB	Address	Prop. Simrad address for SSBL	PSMSSB
,hhmmss.ss	Time	Empty or Time of reception	
,cc	Tp_code	Example: B01, B33, B47	%03d
,A	Status	A for OK and V for not OK	A/V
,cc	Error_code	Empty or a three character error code	ExD/ExM
,a	Coordinate_system	C for Cartesian, P for Polar, U for UTM coordinates	C
,a	Orientation	H for Vessel head up, N for North, E for East	N
,a	SW_filter	M means Measured, F Filtered, P Predicted	M
,x.x	X_coordinate	See separate explanation below	Northing
,x.x	Y_coordinate	See separate explanation below	Easting
,x.x	Depth	Depth in meters	depth
,x.x	Expected_accuracy	The expected accuracy of the position	Sqrt(Tx2+ty2)
,a	Additional_info	N for None, C Compass, I inclimeter, D Depth, T Time	
,x.x	First_add_value	Empty, Tp compass or Tp x inclination	
,x.x	Second_add_value	Empty or Tp y inclination	
*hh	Checksum	Empty or Checksum	*ck
CRLF	Termination		CRLF

Example: `$PSIMSSB,,B01,A,,P,H,M,111.80,63.43,48.50,0.00,N,,*5E`

A.4 HIPAP HPR 418 (fix and mobile)

Please refer to the Kongberg document HPR418BCD_revC.doc.

Transponder position message: the frame contains 32 bytes in binary format.

Example data:

X=1234.56m Y=-987.65m Depth 1234.5m Heading 59.9° Pos. to ROV 15. Training mode

The difference between the **mobile** and **fixed** protocols is made in the Byte 3 Bit 5. The bit is equal to 1 in the mobile case and 0 in the fixed case.

Message		Example		
Byte 0	0xDF	DF	Start of message	
Byte 1	0x01		Head byte 1- SSBL position	
Byte 2	0xSS		Status Byte 1 Bit 0: Position Measurement OK Bit 1: Position measurement filtered Bit 2: Position measurement predicted (always 0 for USBL-BOX) Bit 3: Optional data SSBL OK (pressure sensor only for USBL-BOX TP) Bit 4-6: Always 0 Bit 7: Transceiver error (opposite of Bit 0)	
Byte 3	0x20		Status Byte 2 Bit 0-1: Transducer number (MSB s/n USBL-BOX) Bit 2-3: Transceiver number (LSB s/n USBL-BOX) Bit 4: Training mode (always 0 for USBL-BOX) Bit 5: Mobil TP (SSBL) Rov TP (LBL) (0 fixed, 1 mobile) Bit 6: LBL co-ordinates in UTM (always 0 for USBL-BOX) Bit 7: Master 0, Slave 1 (always 0 for USBL-BOX)	
Byte 4	0x01		TP. Inf. 0 - TP (Transponder) 1 - Depth TP Optional Data 1 2 - Inclinometer TP Optional Data 1&2 /* not used here 3 - Diff.in.TP Optional Data 1&2 /*not used here 4 - Compass TP Optional Data 1 /* not used here 5 - Acoustic control transponder /* not used here 6 - Beacon /* not used here 7 - Depth Beacon /* not used here 10 -Responder driver 1 /* not used here 13 - Responder driver 4	
Byte 5 Byte 6	0x00 0xTT		TP ID	 From 0 to 99
Byte 7 Byte 8 Byte 9	0xsY 0xYY 0xYY		Y position	s = 0 if Y positive (Y HIPAP) s = D if Y negative BCD coded, LSB = 1/10 of unit
Byte 10 Byte 11 Byte 12	0xsX 0xXX 0xXX		X position	s = 0 if X positive (X HIPAP) s = D if X negative BCD coded, LSB = 1/10 of unit
Byte 13 Byte 14 Byte 15	0xsZ 0xZZ 0xZZ		Z position	s = 0 if Z positive s = D if Z negative BCD coded, LSB = 1/10 of unit
Byte 16 Byte 17	0xHH 0xHH		Heading LSB Heading MSB	0° to 359.9° LSB=0.1° BCD coded
Byte 18 Byte 19	XsD 0xDD		Sensor Depth Optional Data 1	Meters S = 0

Byte 20	0xDD			BCD coded
Byte 21 Byte 22 Byte 23	0x00 0x00 0x00		Optional Data 2	Always 0
Byte 24 Byte 25	0x00 0x00		Horizontal error Ellipse direction	Always 0
Byte 26 Byte 27	0x00 0x00		Horizontal error Ellipse major	Always 0
Byte 28 Byte 29	0x00 0x00		Horizontal error Ellipse minor	Always 0
Byte 30	0xXX	XX	Checksum	
Byte 31	0xFF	FF	End of frame	

Transponder position message: the frame contains 32 bytes in binary format.

Message			
Byte 0	0xDF	Start of message	
Byte 1	0x03	Head byte	TP sequence Telegram
Byte 2	0xSS	Number of transponder in use	From 1 to 13
Byte 3 Byte 4	0xTT 0xTT	Number of TP 1	From 1 to 999
Byte 5 Byte 6	0xTT 0xTT	Number of TP 2	From 1 to 999
Byte 7 Byte 8	0xTT 0xTT	Number of TP 3	From 1 to 999
Byte 9 Byte 10	0xTT 0xTT	Number of TP 4	From 1 to 999
Byte 11 Byte 12	0xTT 0xTT	Number of TP 5	From 1 to 999
Byte 13 Byte 14	0xTT 0xTT	Number of TP 6	From 1 to 999
Byte 15 Byte 16	0xTT 0xTT	Number of TP 7	From 1 to 999
Byte 17 Byte 18	0xTT 0xTT	Number of TP 8	From 1 to 999
Byte 19 Byte 20	0xTT 0xTT	Number of TP 9	From 1 to 999
Byte 21 Byte 22	0xTT 0xTT	Number of TP 10	From 1 to 999
Byte 23 Byte 24	0xTT 0xTT	Number of TP 11	From 1 to 999
Byte 25 Byte 26	0xTT 0xTT	Number of TP 12	From 1 to 999
Byte 27 Byte 28	0xTT 0xTT	Number of TP 13	From 1 to 999
Byte 29	0x00	Dummy byte	Filled with 0
Byte 30	0xXX	Checksum	Bytes OR exclusive (except Checksum and End of frame). Bit 7 of the Checksum is always 0.
Byte 31	0xFF	End of frame	

A.5 iXSea USBL INS 1

Byte Nb	Field	Nb of bits	Definition	Value		
				LSB	Min	Max
1	GG_{hex}	8	header	55_{hex}		
2	Bits 2 to 0	3	Message number	001_{bin}		
	Bits 7 to 3	5	Transponder ID	NA	0	31
3, 4, 5, 6	$LLLLLLLL_{hex}$	32	Latitude (deg) (Two-complement coded)	$180/2^{32}$	- 90 °	$90x(1-2^{32})$ °
7, 8, 9, 10	$NNNNNNNN_{hex}$	32	Longitude (deg)	$360/2^{32}$	0 °	$360.(1-2^{32})$ °
11 to 12	$ZZZZZ_{hex}$ (8+8+4 bits: - byte11, - byte12, - bits 3 to 0 dof byte 13)	20	Z (m), immersion	0,01 m	0 m (00000_{hex})	+10485,75 m ($FFFFF_{hex}$)
13	Bit 4	1	Reserved			
	Bits 7 to 5	3	Major axe XY: long axe (in m) of the error ellipse representing the standard deviation on the position in the XY plane 000: 0 m < standard deviation < 0,5 m 001: 0,5 m < standard deviation < 1,5 m 010: 1,5 m < standard deviation < 3 m 011: 3 m < standard deviation < 6 m 100: 6 m < standard deviation < 12 m 101: 12 m < standard deviation < 25 m 110: 25 m < standard deviation < 50 m 111: standard deviation > 50 m			
14	Bit 0	1	Reserved			
	Bits 3 to 1	3	Minor axe XY: small axe (in m) of the error ellipse representing the standard deviation of the position in the XY plane 000: 0 m < standard deviation < 0,5 m 001: 0,5 m < standard deviation < 1,5 m 010: 1,5 m < standard deviation < 3 m 011: 3 m < standard deviation < 6 m 100: 6 m < standard deviation < 12 m 101: 12 m < standard deviation < 25 m 110: 25 m < standard deviation < 50 m 111: standard deviation > 50 m			
	Bits 7 to 4	4	Angle between the North and the major axe of the XY error ellipse I	$180/2^{4}$	0 °	15/16 x180 °
15	Bit 0	1	Reserved			
	Bits 3 to 1	3	Standard deviation of the Z(m) position 000: 0 m < standard deviation < 0,5 m 001: 0,5 m < standard deviation < 1,5 m 010: 1,5 m < standard deviation < 3 m 011: 3 m < standard deviation < 6 m 100: 6 m < standard deviation < 12 m 101: 12 m < standard deviation < 25 m 110: 25 m < standard deviation < 50 m 111: standard deviation > 50 m			
	Bits 7 to 4	4	Reserved			

Byte Nb	Field	Nb of bits	Definition	Value		
				LSB	Min	Max
16	PP_{hex}	8	Reserved			
17, 18 19	rrrrrrrrrrrrrrrrrrrr$_{bin}$ (8+8+6 bits of: - byte 17, - byte 18, - bits 5 to 0 of byte 19)	22	It is the truncation of the absolute time provided by the GPS to the USBL-BOX, keeping only the minutes, seconds, and milliseconds. It is coded in milliseconds number.	1 ms	0 ms	(3 599 999 ms, i.e. 1h - 1ms The largest values of this field do not have any meaning
	Bits 7 and 6 of byte19	2	Reserved			
20	KK_{hex}	8	Status byte Bits 0 to 8 - Reserved			
21	SS_{hex}	8	Checksum exclusive OR by byte for the whole 20 first bytes thus header included.			

Immersion definition

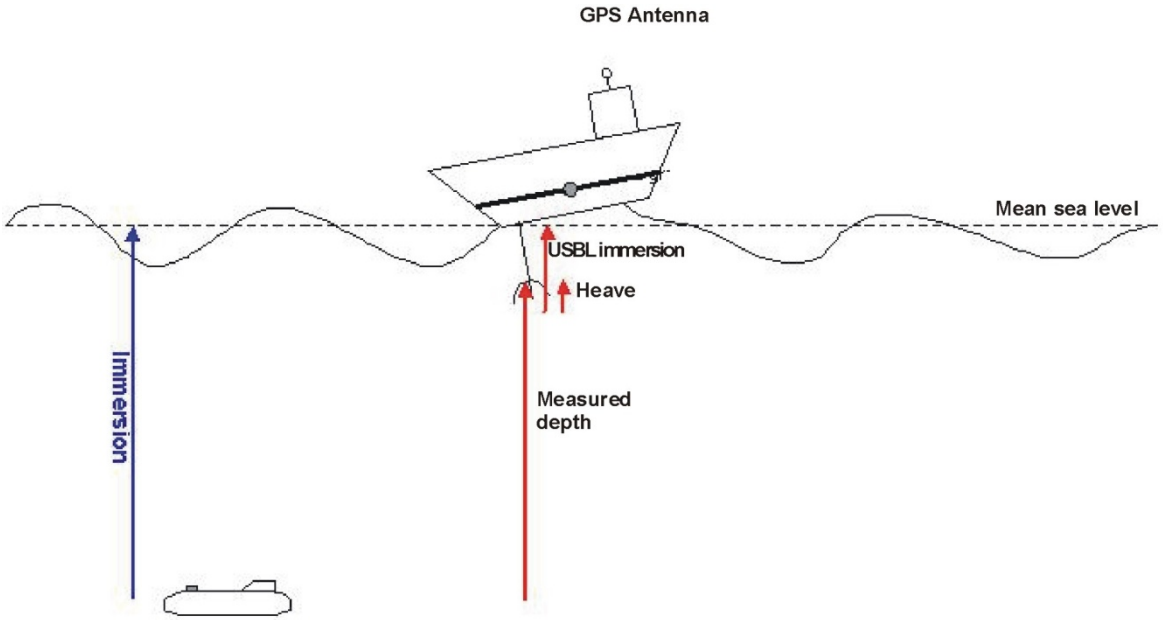
The immersion corresponds to the mobile depth with respect to the mean sea level (thus heave corrected). This data is coherent with the one that would be given by a depth sensor on the underwater mobile. But it does not allow to deduce the absolute position as there is no compensation for tide.

A.6 iXSea USBL INS 2

Message	$PXUI2,id,lat,lon,imm,maj,min,ang,dev,tim*CK	
Field 1	Transponder ID	
Field 2	Latitude (deg)	Resolution: 180/232 Domain: [-90 .. 90 x (1-232)]
Field 3	longitude (deg)	Resolution: 360/232 Domain: [-90 .. 360 x (1-232)]
Field 4	Immersion (m)	Resolution: 0,01 m Domain: [0 .. +10485,75]
Field 5	Major axe XY (m) Long axe of the error ellipse representing the standard deviation on the position in the XY plane	0: 0 m < standard deviation < 0,5 m 1: 0,5 m < standard deviation < 1,5 m 2: 1,5 m < standard deviation < 3 m 3: 3 m < standard deviation < 6 m 4: 6 m < standard deviation < 12 m 5: 12 m < standard deviation < 25 m 6: 25 m < standard deviation < 50 m 7: standard deviation > 50 m
Field 6	Minor axe XY (m) Small axe of the error ellipse representing the standard deviation of the position in the XY plane	0: 0 m < standard deviation < 0,5 m 1: 0,5 m < standard deviation < 1,5 m 2: 1,5 m < standard deviation < 3 m 3: 3 m < standard deviation < 6 m 4: 6 m < standard deviation < 12 m 5: 12 m < standard deviation < 25 m 6: 25 m < standard deviation < 50 m 7: standard deviation > 50 m
Field 7	Angle between the North and the major axe of the XY error ellipse	Resolution: 180/24 Domain: [0 .. 15/16 x 180]
Field 8	Standard deviation of the Z(m) position	0: 0 m < standard deviation < 0,5 m 1: 0,5 m < standard deviation < 1,5 m 2: 1,5 m < standard deviation < 3 m 3: 3 m < standard deviation < 6 m 4: 6 m < standard deviation < 12 m 5: 12 m < standard deviation < 25 m 6: 25 m < standard deviation < 50 m 7: standard deviation > 50 m
Field 9	Truncation of the absolute time provided by the GPS to the USBL-BOX, keeping only the minutes, seconds, and milliseconds. It is coded in milliseconds number.	Resolution: 1ms Domain: [0 .. 3 599 999] The largest values of this field do not have any meaning

Immersion definition

The immersion corresponds to the mobile depth with respect to the mean sea level (thus heave corrected). This data is coherent with the one that would be given by a depth sensor on the underwater mobile. But it does not allow to deduce the absolute position as there is no compensation for tide.



Immersion	=	Measured depth (by the USBL acoustic array)
	-	Heave
	+	USBL immersion

A.7 NAUTRONIX ATS II

Message	**Date Time B: Transp E: Status X: PosX Y: PosY D: psoZ H: Heading P: pitch R: roll <CR><LF>**	
Field 1	Date	dd month AAAA
Field 2	Time	HH:MM:SS:mmm
Field 3	Transponder number	From 1 to 127
Field 4	Status	0
Field 5	X coordinate	In meters (‘+’ when directed to starboard)
Field 6	Y coordinate	In meters (‘+’ when directed to the bow)
Field 7	Z coordinate	In meters (‘+’ when directed to the bottom)
Field 8	Heading	In degrees (‘+’ clockwise)
Field 9	Pitch	In degrees (‘+’ when bow up)
Field 10	Roll	In degrees (‘+’ when starboard up)

A.8 POSIDONIA 6000

- Data received: Transponder number, Transponder latitude, Transponder longitude, Transponder depth, Latitude standard deviation, Longitude standard deviation, Depth standard deviation, Delay
- Data frame: Binary format (32 bytes)

Message	**<Sync><F1><F2>…..<F8><Ch1Ch2>**	
Byte 0	0x24	Synchronization byte
Data Field 1 Byte 1	Transponder number	Warning: The first received number is used as a synchronization byte for all the other inputs
Data Field 2 Bytes 2 to 5	Transponder latitude	$+/-2^{32}$ = +/-Pi signed 32 bits
Data Field 3 Bytes 6 to 9	Transponder longitude	$+/-2^{32}$ = +/-Pi signed 32 bits
Data Field 4 Bytes 10 to 11	Transponder depth	IEEE floating point format , meters Warning: Not used by the INS
Data Field 5 Bytes 12 to 17	Latitude standard deviation	IEEE floating point format , meters
Data Field 6 Bytes 18 to 21	Longitude standard deviation	IEEE floating point format , meters
Data Field 7 Bytes 22 to 25	Depth standard deviation	IEEE floating point format , meters
Data Field 8 Bytes 26 to 29	Delay	IEEE floating point format , seconds
Bytes 30 to 31	Checksum	Addition of all the bytes from 0 to 29. Warning: 2 characters

A.9 USBLBOX_POSTPRO

Terminology

- CRP: Common Reference Point
- BRD: Acoustic Antenna Mounting Flange
- CAC: Acoustic center of the acoustic antenna
- RIXI: iXSea Reference Frame
  - X+: towards the bow (axis of the ship)
  - Y+: towards starboard
  - Z+: upward
  - Roll+: port goes down
  - Pitch+: bow goes down
  - Heading+: Bow goes to port.
- RANT: Acoustic antenna reference frame
  - X+ towards H1
  - Y+ towards H4
  - Z+ downwards
- RIXI o CRP : iXSea reference frame centered on common reference point
- RANT o BRD : Acoustic antenna reference frame centered on the center of the mounting flange
- RANT o Hx : Acoustic antenna reference frame centered on hydrophone x

Overview

USBL REJEU protocol comprises all necessary data for payback:

- Configuration data (supposed invariant)
  - System characteristics
  - Beacon characteristics
- Operational environment data
  - Antenna calibration
  - System Installation
  - Sound speed profile
- Input data
  - Time
  - Raw navigation data
  - Detection characteristics
  - Ancillary data

Protocol Structure

The protocol comprises binary datagrams produced by the equipment. It contains the sufficient and necessary data for playback of the applied real time processing.

The datagrams comprise :

- Header for identification and characterization
- Main body of data described in the header
- Checksum (bytes sum)

Data Type

The following conventions are applied:

Type	Description
byte	Unsigned 8 bits integer
short	Signed 16 bits Integer
ushort	Unsigned 16 bits Integer
long	Signed 32 bits Integer
ulong	Unsigned 32 bits Integer
float	Float IEEE 754 32 bits

- 16 and 32 bytes encoded data are described with the Big endian convention (strong weight byte sent first)
- NaN have a value of Ox7FC00000

System Identification

This datagram gathers the configuration elements of the system.

	Description	Format	Unit	Observation	
Header	Synchronization	byte		'$'	
	Total Size	byte		30	
	Datagram ID	byte		$80	
	Datagram release number	byte		$01	
Identification	Equipment Type	ushort		0	Inconnu
				1	GAPS - TITAN – CL
				2	GAPS - CARBON – ML
				3	GAPS - TITAN – ML
				4	(U-BOX) - FLUSH
				5	(U-BOX) - CAGE
	Serial Number	ushort			
Version	FPGA DSP	ulong		MMSB	implementation
	Firmware DSP	ulong		MSB	major release
	FPGA Mother board	ulong		LSB	minor release
	Firmware Mother board	ulong		LLSB	correction
	Algorithms	ulong			
	Checksum	ushort			

System Characteristics

This datagram gathers the identification elements of the system.

	Description	Format	Unit	Observation
Header	Synchronization	byte		'$'
	Total Size	byte		16
	Datagram ID	byte		$81
	Datagram release number	byte		$01
Parameters	Demodulation frequency	float	Hertz	
	Maximum phase error	float	radian	
	Maximum phase jumps	short		`
	Checksum	ushort		

Transponders Characteristics

This datagram gathers the transponder configuration elements.

	Description	Format	Unit	Observation	
Header	Synchronization	byte		'$'	
	Total Size	byte		35	
	Datagram ID	byte		$82	
	Datagram release number	byte		$01	
Ctrl	Transponder number	short		Positif, Base 0	
	Total number of transponder	short		Positif, max 50	
Transponder	Transponder ID	short			
	Transponder type	short		-1	Générique
				0	RT8 MF
				1	Monotonal MF
				2	RT9 MF
				3	MT9 MF
				4	BT8 MF
				5	RT9 BF
				6	RAMSES 6000 BF
				7	ET9 BF
				8	RTT4 BF
				9	RT8 BF
	Code / interrogation frequency	ushort	- / Hz	< 8000 : code MFSK	
	Code / response frequency	ushort	- / Hz	>= 8000 : frequency	
	Operational behavior	byte		0	None
				1	Fixed transponder
				2	Mobile transponder
	Interrogation mode	byte		0	Transponder
				1	Primary responder
				2	Spontaneous (pinger)

				3	Secondary Responder
	Turn around time	short	ms		
	Reply signal	float	Hertz		
	Depth management	byte		0	No known depth
				1	Pressure sensor
				2	Not used
				3	Acoustic telemetry
				4	Configuration depth
	Accuracy of the configuration depth	float	meter		
	Accuracy of the depth by pressure measurement	float	meter		
	Checksum	ushort			

Antenna Calibration

This protocol gathers the acoustic antenna characteristics (theoretical and measured)

	Description		Format	Unit	Observation
Header	Synchronization		byte		'$'
	Total Size		byte		102
	Datagram ID		byte		$83
	Datagram release number		byte		$01
Theoretical antenna	Pair H1 / H2	Delta X	float	meter	RANT o H1
		Delta Y	float	meter	RANT o H1
		Delta Z	float	meter	RANT o H1
		Delta Phase	float	radian	
	Pair H2 / H3	Delta X	float	meter	RANT o H2
		Delta Y	float	meter	RANT o H2
		Delta Z	float	meter	RANT o H2
		Delta Phase	float	radian	
	Pair H3 / H4	Delta X	float	meter	RANT o H3
		Delta Y	float	meter	RANT o H3
		Delta Z	float	meter	RANT o H3
		Delta Phase	float	radian	
Measured antenna	Pair H1 / H2	Delta X	float	meter	RANT o H1
		Delta Y	float	meter	RANT o H1
		Delta Z	float	meter	RANT o H1
		Delta Phase	float	radian	
	Pair H2 / H3	Delta X	float	meter	RANT o H2
		Delta Y	float	meter	RANT o H2
		Delta Z	float	meter	RANT o H2
		Delta Phase	float	radian	
	Pair H3 / H4	Delta X	float	meter	RANT o H3
		Delta Y	float	meter	RANT o H3

		Delta Z	float	meter	RANT o H3
		Delta Phase	float	radian	
	Checksum		ushort		

System Installation

This protocol gathers all the elements describing the system geometry.

	Description		Format	Unit	Observation
Header	Synchronization		byte		'$'
	Total Size		byte		62
	Datagram ID		byte		$84
	Datagram release number		byte		$01
Misalignments	Attitude sensor	Delta Heading	float	degree	RIXI
		Delta Roll	float	degree	RIXI
		Delta Pitch	float	degree	RIXI
	Mounting flange	Delta Heading	float	degree	RIXI
		Delta Roll	float	degree	RIXI
		Delta Pitch	float	degree	RIXI
Offsets	Position sensor	Delta X	float	meter	RIXI o CRP
		Delta Y	float	meter	RIXI o CRP
		Delta Z	float	meter	RIXI o CRP
	Mounting Flange	Delta X	float	meter	RIXI o CRP
		Delta Y	float	meter	RIXI o CRP
		Delta Z	float	meter	RIXI o CRP
	Sea Level	Delta Z	float	meter	RIXI o CRP
	Acoustic center	Delta Z	float	meter	RANT o BRD
	Checksum		ushort		

Sound Velocity Profile Pair

The sound velocity profile comprises depth/velocity pairs.

	Description	Format	Unit	Observation
Header	Synchronization	byte		'$'
	Total Size	byte		18
	Datagram ID	byte		$85
	Datagram release number	byte		$01
Ctrl	Pair number	short		>0, Base 0
	Total number of pairs	short		>0, Maximum 55
Pair	Depth	float	meter	>0
	Velocity	float	m/s	between 1400 and 1600
	Checksum	ushort		

Detection and detection context

This datagram gathers all elements describing detections and their contexts.

	Description		Format	Unit	Observation
Header	Synchronization		byte		'$'
	Total Size		byte		219
	Datagram ID		byte		$86
	Datagram release number		byte		$01
	Transponder ID		short		
Time	Interrogation	Seconds	ulong	s	Base 01/01/1970 (time_t)
		Micro seconds	ulong	µs	
	Detection	Seconds	ulong	s	Base 01/01/1970 (time_t)
		Micro seconds	ulong	µs	
Interrogation raw position	Position	Latitude	long		$[-2^{31}..+2^{31}] \equiv [-180..+180]$
		Longitude	long		$[-2^{31}..+2^{31}] \equiv [-180..+180]$
		Altitude	float	meter	
	Position accuracy	Latitude	float	meter	
		Longitude	float	meter	
		Altitude	float	meter	
	Attitude	Heading	float	degree	
		Roll	float	degree	
		Pitch	float	degree	
		Heave	float	meter	
	Attitude accuracy	Heading	float	degree	
		Roll	float	degree	
		Pitch	float	degree	
		Heave	float	meter	
	Speed	North	float	m/s	
		East	float	m/s	
		Vertical	float	m/s	
Detection raw position	Position	Latitude	long		$[-2^{31}..+2^{31}] \equiv [-180..+180]$
		Longitude	long		$[-2^{31}..+2^{31}] \equiv [-180..+180]$
		Altitude	float	meter	
	Position accuracy	Latitude	float	meter	
		Longitude	float	meter	
		Altitude	float	meter	
	Attitude	Heading	float	degree	
		Roll	float	degree	
		Pitch	float	degree	
		Heave	float	meter	
	Attitude accuracy	Heading	float	degree	
		Roll	float	degree	

		Pitch	float	degree		
		Heave	float	meter		
	Speed	North	float	m/s		
		East	float	m/s		
		Vertical	float	m/s		
Acoustic detection (49)	Arrival time	H1	float	S	interrogation	
		H2	float	S	interrogation	
		H3	float	S	interrogation	
		H4	float	s	interrogation	
	Phase	H1	float	radian		
		H2	float	radian		
		H3	float	radian		
		H4	float	radian		
	Noise Signal Ratio	H1	float	dB		
		H2	float	dB		
		H3	float	dB		
		H4	float	dB		
	Validity	H1	byte		Bit 0	[0,1] ≡ [invalid, valid]
		H2			Bit 1	[0,1] ≡ [invalid, valid]
		H3			Bit 2	[0,1] ≡ [invalid, valid]
		H4			Bit 3	[0,1] ≡ [invalid, valid]
Auxiliary data	Known depth		float	meter		
	Origin of known depth		byte		0	Invalid known position
					1	Pressure sensor
					2	Not used
					3	Acoustic telemetry
					4	Configuration depth
	Known CAC velocity		float	m/s		
	Origin of the known CAC velocity		byte		0	Unknown CAC Velocity
					1	Speed profile
					2	Temperature data
	Checksum		ushort			

Raw Transponder Position

This datagram contains the result of position computation made in real time.

	Description		Format	Unit	Observation
Header	Synchronization		byte		'$'
	Total Size		byte		56
	Datagram ID		byte		$87
	Datagram release number		byte		$01
	Transponder ID		short		
	Age de la position		ulong	µs	Since emission
Time	Emission	Seconds	ulong	s	Base 01/01/1970 (time_t)
		Micro seconds	ulong	µs	
Transponder	Position	Latitude	long		$[-2^{31}..+2^{31}] \equiv [-180..+180]$
		Longitude	long		$[-2^{31}..+2^{31}] \equiv [-180..+180]$
		Immersion	float	meter	Not tide corrected
	Covariance position	North / North	float	$meter^2$	
		North / East	float	$meter^2$	
		North / Depth	float	$meter^2$	
		East / East	float	$meter^2$	
		East / Depth	float	$meter^2$	
		Depth / Depth	float	$meter^2$	
	Checksum		ushort		

A.10 PIFM-POPSN

$PIFM,POPSN,JJ/MM/AAAA,HH:MM:SS,DDD,ddd.dd,±vv.vv,±vv.vv,CCCC,nn,JJ/MM/AAAA,HH:MM:SS.DDD,s,dd,mm.mmmm,s,ddd,mm.mmmm,mmmm,c,c,mmmm,[CR][LF]

Message		Format	Bytes
Header	ID	$PIFM,POPSN,	12
	Date	JJ/MM/AAAA,	11
	Time	HH:MM:SS,DDD,	13
Heading and Speed	Heading (0 à 360), degrees	ddd.dd,	7
	Speed X, knots	±vv.vv,	7
	Speed Y, knots	±vv.vv,	7
Transponder or other Mobile Device Position	Transponder or mobile device ID *	4 characters,	5
	Transponder number	nn,	3
	Position date	JJ/MM/AAAA,	11
	Time position	HH:MM:SS.DDD,	13
	Latitude in degrees, s is the sign of the latitude	s,dd,mm.mmmm,	13
	Longitude in degrees, s is the sign of the longitude	s,ddd,mm.mmmm,	14
	Depth, meters	mmmm,	5
	Validity X, Y (F valid and 0 for invalid)	c,	2
	Validity Z (0: invalid, 1: computed value, 2: measure)	c,	2
	Depth sensor data, meters	mmmm,	5
Message End	End	[CR][LF]	2

* ID: transponder ID in 4 characters (example for transponder 1: « 0001 », for transponder 26: « 0026 »)

B. INPUT PROTOCOLS

B.1 $xxGGA / $xxVTG

Data sent: Latitude, Longitude of the ship or GAPS, GPS quality

$GPGGA,hhmmss.ss,ddmm.mmmmm,a,dddmm.mmmmm,b,q,ss,...,…,.,…,.,…,….* hh<CR><LF>	
hhmmss.ss	is the UTC of position
ddmm.mmmmm	is the latitude in degrees and in minutes and 1/100000
a	is the hemisphere N: North S: South
dddmm.mmmmm	is the longitude in degrees and in minutes and 1/100000
b	is longitude sign (E: East, W: West)
q	is the GPS quality indicator • 0 Fix not valid • 1 GPS SPS Mode fix valid • 2 Differential Mode, SPS Mode, fix valid • 3 GPS PPS Mode, fix valid • 4 RTK • 5 Float RTK
ss	is the number of satellites
*hh	is optional

B.2 $xxZDA

Data received: the Universal Time information

$GPZDA,hhmmss.ss,dd,mm,yyyy,xx,yy*cc<CR><LF>	
hhmmss.ss	is the UTC time in hours, minutes, seconds of the GPS position
dd	is the day dd = 0 to 31
mm	is the month mm =1 to 12
yyyy	is the year
xx	is the local zone description in hours xx = -13 to 13
yy	is the local zone description in minutes yy = 0 to 59
*cc	is the checksum

B.3 $ZQMTE

$GPZDA, jj/mm/aa,hh : mm : ss.s		
Function	Hour	
Field1	Date	Day, Month, Year
Field 2	Time	Hour, Minute, Seconds and tenths of seconds

B.4 SIMRAD EM

THIS PROTOCOL MUST HAVE A RATE OF 20 HZ.

- Standard: SIMRAD owned format
- Data sent Heading, Roll, Pitch, Heave and status

10 bytes binary data protocol

Message	**SS 90 RRRR PPPP hhhh HHHH**		
octet 0	0xSS	octet Sync Sensor status	0x90 ⇒ OK 0x9A ⇒ alignment
octet 1	0x90	Sync octet	
octet 2	0xRRRR	Roll LSB	Roll ± 180° LSB : 0.01° Signe “+” when port goes up
octet 3		Roll MSB	
octet 4	0xPPPP	Pitch LSB	Pitch ± 180° LSB : 0.01° Signe “+” when stern goes up
octet 5		Pitch MSB	
octet 6	0xhhhh	Heave LSB	Heave ± 10 m LSB : 0.01 m Signe “+” when OCTANS goes up
octet 7		Heave MSB	
octet 8	0xHHHH	Cap LSB	Cap 0° to 360° LSB : 0.01°
octet 9		Cap MSB	

B.5 GAPSBIN

THIS PROTOCOL MUST HAVE A RATE OF 20 HZ.

Data	Format	Units
Header	8 bit unsigned integer	Value : '$'
Time tag of data	64 bit unsigned integer	See Note 1
INS interface status 1	32 bit unsigned integer	See [M-SP-POP-099]
INS algorithm status 2	32 bit unsigned integer	See [M-SP-POP-099]
Heading	32 bit IEEE Float	Rad
Roll	32 bit IEEE Float	Rad
Pitch	32 bit IEEE Float	Rad
Latitude	32 bit signed integer +/- 2^{31}= +/-Pi/2	Rad
Longitude	32 bit signed integer +/- 2^{31}= +/-Pi	Rad
Altitude (positive up)	32 bit IEEE Float	m
North speed	32 bit IEEE Float	m/s
West speed	32 bit IEEE Float	m/s
Vertical speed (positive up)	32 bit IEEE Float	m/s
Heave on selected lever arm	32 bit IEEE Float	m
Latitude standard deviation	32 bit IEEE Float	rad
Longitude standard deviation	32 bit IEEE Float	rad
Altitude standard deviation	32 bit IEEE Float	m
Heading standard deviation	32 bit IEEE Float	Rad
Roll standard deviation	32 bit IEEE Float	Rad
Pitch standard deviation	32 bit IEEE Float	Rad
CRC	16 bit unsigned integer	
Fin de trame	8 bit unsigned integer	Valeur : '#'

Time Tag

The 64 bits time tag is described hereafter:

Bit [63..56] spare

Bit [55..52] x 10 days (0 à 3)

Bit [51..48] days (0 à 9)

Bit [47..44] x 10 hour (0 à 2)

Bit [43..40] hours (0 à 9)

Bit [39..35] x 10 minutes (0 à 5)

Bit [34..31] minutes (0 à 9)

Bit [31..28] x 10 seconds (0 à 5)

Bit [27..24] seconds (0 à 9)

Bit [23..20] x 1/10 seconds (0 à 9)

Bit [19..16] x 1/100 seconds (0 à 9)

Bit [15..12] x 1000 µseconds (0 à 9)

Bit [11..8] x 100 µseconds (0 à 9)

Bit [7..4] x 10 µseconds (0 à 9)

Bit [3..0] µseconds (0 à 9)

B.6 $PMEVL

Data received: Pressure value

$PMEVL,XP,MEA,C,VVVVV*cc<CR><LF>	
XP	is the transponder ID (from 001 up o 128)
MEA	is a mnemonic
C	is the analog channel, C = 8
VVVVV	is the Pressure value VVVVV = 0 to 65535 dBars (integer)
*cc	or VVVV.V = 0.0 to 9999.9 dbars (float) is the checksum

B.7 $WIMTW

This protocol is used to know the water temperature at the face of the antenna.

$WIMTW,x.y,C*xx	
x, y	Temperature en Celsius degrees The C is mandatory and means Celsius

C. CHOOSING AN IP ADDRESS AND A SUBNET MASK

You need to change the configuration, you need to provide two IP (Internet Protocol) addresses for both the USBL-BOX and the PC. Keep track of the addresses entered on both systems, as they are different. You need to setup a private network between the PC and the USBL-BOX, you need to select an address for the PC and the USBL-BOX.
For example, in private network addresses, it is usually recommended to use addresses of

- Either Class B (169.254.0.0 to 169.254.255.255) – Subnet Mask: 255.255.0.0
- Or Class C (192.168.0.0 to 192.168.0.255) – Subnet Mask: 255.255.255.0

For Class C, the first (e.g. 192.168.0.0) and last (e.g. 192.168.0.255) addresses are reserved and therefore they cannot be used.

It is recommended to select two addresses from the same range set. For example:

- Either 169.254.0.1 for USBL-BOX and 169.254.0.2 for the PC (Subnet 255.255.0.0)
- Or 192.168.1.10 for USBL-BOX and 192,168.1.11 for the PC (Subnet 255.255.255.0)

D. WIRING OF THE POSIDONIA ANTENNA

First column: Definition of the connection point on the connector

Second column: Description of the function of the transmitted signal

Third column: Definition of the connection point on the board REAR FACE of the rack (except for the two wires dedicated to transmission that are directly connected to the HT board)

Pin	Function	Connected to
A	Power Supply +12V	J15 pin 3
B	Ground +12V (GND B)	J15 pin 4
D	Gain+	J35 pin 1
G	Gain-	J35 pins 2, 3, 4, 5
H	Gain-	J35 pins 2, 3, 4, 5
K	Channel 1 +	J19 pin 1
L	Channel 1 -	J19 pins 2, 3, 4, 5
N	Channel 2 +	J22 pin 1
P	Channel 2 -	J22 pins 2, 3, 4, 5
S	Channel 3 +	J25 pin 1
T	Channel 3 -	J25 pins 2, 3, 4, 5
V	Channel 4 +	J32 pin 1
W	Channel 4 -	J32 pins 2, 3, 4, 5
b	Transmission HOT (brown)	Brown wire (direct HT)
c	Transmission COLD (yellow)	Yellow wire (direct HT)
e	Power supply -12V	J15 pin 1
f	Ground -12V (GND B)	J15 pin 2
p	Contact hydro +	J39 pin 1
q	Contact hydro -	J39 pins 2, 3, 4, 5

E. MECHANICAL DRAWING